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AERODROMES (AGA)

Table of Contents

GENERAL INFORMATION AND AERODROME LIGHTING AND MARKING

INTRODUCTION

1 This section contains information of all aerodromes which
e available for international air operations.

2 These aerodromes are classified and tabulated in three cat-
ories. AGA 1 covers those aerodromes designated as Aero-
omes of Entry or Departure and relate only to the use of the
rodromes and the clearance formalities involved.

3 AGA 2 comprises a detailed description of the major aero-
omes designated for use by international air services.

4 AGA 3 (Aerodromes Directory) details briefly the physical
aracteristics of all aerodromes that are open for public use.

AERODROME ADMINISTRATION

1 The administration of all airports is the responsibility of
e aerodrome owner. The aerodrome owner and address is
entified in AGA 2, items 9 through 11.

2 Ownership of aerodromes in the United States is vested in
ee different groups; the Federal Government, non-federal gov-
nments and private organizations or individuals. It is the pol-
y of the U.S. Federal Government to have its aerodromes com-
y with ICAO Standards and Recommended Practices. Excep-
ns are noted as differences below. Aerodromes owned by non
deral governments and private organizations or individuals are
couraged to comply with international Standards and Rec-
nmended Practices in part through the regulation of aircraft
erations into the aerodromes and in part through agreements
der which Federal aid is made available for aerodrome devel-
ment or improvement. Further compliance is by voluntary ac-
n on the part of the aerodrome owner.

CONDITIONS OF AVAILABILITY

1 An aerodrome which is open for public use may be used
a particular aircraft upon consideration of the meteorological
nditions existing at the time and provided that the aircraft's
rformance and load classification (runway weight-bearing
ssification) is consistent with the physical characteristics of
e aerodrome.

2 Civil aircraft are not permitted to land at any aerodrome
t listed in this AIP except in cases of real emergency or
ere special permission has been granted.

3 Civil Use of Military Fields

3.1 U.S. Army, Air Force, Navy and Coast Guard Fields are
en to civil fliers in emergency or with prior permission.

3.1.1 At Army installations, prior permission is authorized
the Commanding Officer of the installation.

3.1.2 At Air Force installations, prior permission should be
quested at least 30 days prior to first intended landing from
her Headquarters USAF (PRPOC) or the Commander of the
tallation concerned (who has authority to approve landing
hts for certain categories of civil aircraft). For use of more than one Air Force installation, requests should be forward direct to Hq USAF (PRPOC), Washington, D.C. 20330. Use of USAF installations must be specifically justified.

3.3.1.3 For Navy and Marine Corps installations, prior permission should be requested at least 30 days prior to first intended landing. Any Aviation Facility Licenses must be approved and executed by the Navy prior to any landing by civil aircraft. Applications to land must include the following:

A. Application for Aviation Facility License (OPNAV Form 3770/1 (Rev.7-70)) in quadruplicate.

B. Certificate of Insurance (NAVFAC Form 7-11011/36 (7-70)) in duplicate, signed by an official of the insurance company.

Forms may be obtained from the nearest U.S. Navy or Marine Corps aviation facility.

With minor exceptions, authority to use Navy and Marine Corps fields is granted only to aircraft on government business, or when no suitable civil airport is available in the vicinity.

Applications should be forwarded, as appropriate, to one of the following:

A. Use of one airfield only: to the Commanding Officer of the field concerned (who has the authority to approve landing rights for certain categories of civil aircraft).

B. Use of Naval Station Adak, Alaska; Naval Air Station, Agana, Guam; and/or Naval Station Midway for trans-Pacific ferry operations making refueling and crew rest stops ("technical stops") wherein crewmembers only, (no passengers) are embarked: to Commander in Chief, U.S. Pacific Fleet Post Office, San Francisco 96610, with an additional copy of the application via air mail to the Commanding Officer of each of the foregoing facilities at which a technical stop is desired.

C. All others: to the Commander, Naval Facilities Engineering Command (Code 205), 200 Stovall Street, Alexandria, VA 22332.

3.3.1.4 For Coast Guard fields prior permission should be requested from the Commandant, U.S. Coast Guard via the Commanding Officer of the field. Use of Coast Guard fields is limited to persons on government business and only when there is no suitable civil airport in the vicinity.

3.3.2 When instrument approaches are conducted by civil aircraft at military airports, they shall be conducted in accordance with the procedures and minimums approved by the military agency having jurisdiction over the airfield.

4. APPLICABLE ICAO DOCUMENTS

4.1 ICAO Standards and Recommended Practices contained in Annex 14 are applied with the exceptions (Differences) noted below and as noted in para 2.2 above.

5. DIFFERENCES FROM ICAO STANDARDS AND RECOMMENDED PRACTICES

See AIP Section DIF

6. MAINTENANCE OF AERODROME MOVEMENT AREAS

6.1 It is the responsibility of the relevant aerodrome authority to maintain the aerodrome in a satisfactory condition.

6.2 Clearance of snow and measurement of snow, ice, standing water, braking action, etc., and the reporting of such pavement conditions is within the responsibility of the aerodrome authority.

7. DISSEMINATION OF INFORMATION ON THE CONDITION OF PAVED SURFACES

7.1 Information on surface condition of runways, taxiways and aprons will be published, when available and when necessary, NOTAM

7.2 At aerodromes where an ATS unit is established, if a runway is affected by standing water, snow, slush or ice during the approach of an aircraft for landing, and such conditions are notified by the aerodrome management to the ATS unit, such conditions will be made available to the aircraft.

8. RESCUE AND FIRE FIGHTING FACILITIES

8.1 Adequate rescue and fire-fighting vehicles, equipment and personnel are provided at aerodromes available for international commercial air transport. Details concerning the equipment available at these aerodromes are given in AGA 2.

8.2 Temporary interruptions to rescue and fire-fighting serv or non-availability of such services, are made known NOTAM.

8.3 Certificated Aerodromes (FAR 139)

Aerodromes serving certain air carriers under FAR, Part 139 indicated by a CRF Index (i.e., CFR Index E), which relate the availability of Crash, Fire, Rescue equipment (see AGA Appendix One).

9. BIRD CONCENTRATIONS IN THE VICINITY OF AERODROMES

Animal and bird notices are not normally published in ae drome remarks. Pilots should be aware that animals and b are frequently found in the vicinity of aerodromes and shc exercise due caution. However, selected bird notices may published, but only after approval by the appropriate Regic Bird Hazard Group.

10. AIRPORT LIGHTING AIDS

10.1 Approach Light Systems (ALS)

10.1.1 Approach light systems provide the basic means transition from instrument flight, to visual flight for land Operational requirements dictate the sophistication and confi ration of the approach light system for a particular runway.

10.1.2 Approach light systems are a configuration of sig lights starting at the landing threshold and extending into the proach area a distance of 2400-3000 feet for precision ins ment runways and 1400-1500 feet for non-precision instrum runways. Some systems include sequenced flashing lights wh appear to the pilot as a ball of light traveling towards the r way at high speed (twice each second).

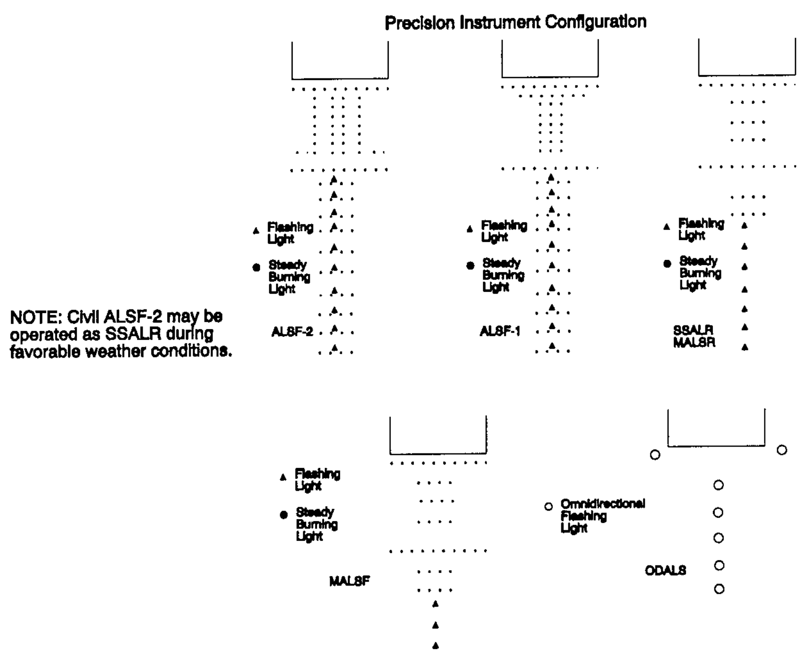

Figure 10.1(1) Precision and Non-precision Instrument Configurations

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AERODROMES (AGA)

Table of Contents

GENERAL INFORMATION AND AERODROME LIGHTING AND MARKING

1. INTRODUCTION

1.1 This section contains information of all aerodromes which are available for international air operations.

1.2 These aerodromes are classified and tabulated in three categories. AGA 1 covers those aerodromes designated as Aerodromes of Entry or Departure and relate only to the use of the aerodromes and the clearance formalities involved.

1.3 AGA 2 comprises a detailed description of the major aerodromes designated for use by international air services.

1.4 AGA 3 (Aerodromes Directory) details briefly the physical characteristics of all aerodromes that are open for public use.

2. AERODROME ADMINISTRATION

2.1 The administration of all airports is the responsibility of the aerodrome owner. The aerodrome owner and address is identified in AGA 2, items 9 through 11.

2.2 Ownership of aerodromes in the United States is vested in three different groups; the Federal Government, non-federal governments and private organizations or individuals. It is the policy of the U.S. Federal Government to have its aerodromes comply with ICAO Standards and Recommended Practices. Exceptions are noted as differences below. Aerodromes owned by non Federal governments and private organizations or individuals are encouraged to comply with international Standards and Recommended Practices in part through the regulation of aircraft operations into the aerodromes and in part through agreements under which Federal aid is made available for aerodrome development or improvement. Further compliance is by voluntary action on the part of the aerodrome owner.

3. CONDITIONS OF AVAILABILITY

3.1 An aerodrome which is open for public use may be used by a particular aircraft upon consideration of the meteorological conditions existing at the time and provided that the aircraft's performance and load classification (runway weight-bearing classification) is consistent with the physical characteristics of the aerodrome.

3.2 Civil aircraft are not permitted to land at any aerodrome not listed in this AIP except in cases of real emergency or where special permission has been granted.

3.3 Civil Use of Military Fields

3.3.1 U.S. Army, Air Force, Navy and Coast Guard Fields are open to civil fliers in emergency or with prior permission.

3.3.1.1 At Army installations, prior permission is authorized by the Commanding Officer of the installation.

3.3.1.2 At Air Force installations, prior permission should be requested at least 30 days prior to first intended landing from either Headquarters USAF (PRPOC) or the Commander of the installation concerned (who has authority to approve landing rights for certain categories of civil aircraft). For use of more than one Air Force installation, requests should be forward direct to Hq USAF (PRPOC), Washington, D.C. 20330. Use of USAF installations must be specifically justified.

3.3.1.3 For Navy and Marine Corps installations, prior permission should be requested at least 30 days prior to first intended landing. Any Aviation Facility Licenses must be approved and executed by the Navy prior to any landing by civil aircraft. Applications to land must include the following:

A. Application for Aviation Facility License (OPNAV Form 3770/1 (Rev.7-70)) in quadruplicate.

B. Certificate of Insurance (NAVFAC Form 7-11011/36 (7-70)) in duplicate, signed by an official of the insurance company.

Forms may be obtained from the nearest U.S. Navy or Marine Corps aviation facility.

With minor exceptions, authority to use Navy and Marine Corps fields is granted only to aircraft on government business, or when no suitable civil airport is available in the vicinity.

Applications should be forwarded, as appropriate, to one of the following:

A. Use of one airfield only: to the Commanding Officer of the field concerned (who has the authority to approve landing rights for certain categories of civil aircraft).

B. Use of Naval Station Adak, Alaska; Naval Air Station, Agana, Guam; and/or Naval Station Midway for trans-Pacific ferry operations making refueling and crew rest stops ("technical stops") wherein crewmembers only, (no passengers) are embarked: to Commander in Chief, U.S. Pacific Fleet Post Office, San Francisco 96610, with an additional copy of the application via air mail to the Commanding Officer of each of the foregoing facilities at which a technical stop is desired.

C. All others: to the Commander, Naval Facilities Engineering Command (Code 205), 200 Stovall Street, Alexandria, VA 22332.

3.3.1.4 For Coast Guard fields prior permission should be requested from the Commandant, U.S. Coast Guard via the Commanding Officer of the field. Use of Coast Guard fields is limited to persons on government business and only when there is no suitable civil airport in the vicinity.

3.3.2 When instrument approaches are conducted by civil aircraft at military airports, they shall be conducted in accordance with the procedures and minimums approved by the military agency having jurisdiction over the airfield.

4. APPLICABLE ICAO DOCUMENTS

4.1 ICAO Standards and Recommended Practices contained in Annex 14 are applied with the exceptions (Differences) noted below and as noted in para 2.2 above.

5. DIFFERENCES FROM ICAO STANDARDS AND RECOMMENDED PRACTICES

See AIP Section DIF

6. MAINTENANCE OF AERODROME MOVEMENT AREAS

6.1 It is the responsibility of the relevant aerodrome authority to maintain the aerodrome in a satisfactory condition.

6.2 Clearance of snow and measurement of snow, ice, standing water, braking action, etc., and the reporting of such pavement conditions is within the responsibility of the aerodrome authority.

7. DISSEMINATION OF INFORMATION ON THE CONDITION OF PAVED SURFACES

7.1 Information on surface condition of runways, taxiways and aprons will be published, when available and when necessary, NOTAM

7.2 At aerodromes where an ATS unit is established, if a runway is affected by standing water, snow, slush or ice during the approach of an aircraft for landing, and such conditions are notified by the aerodrome management to the ATS unit, such conditions will be made available to the aircraft.

8. RESCUE AND FIRE FIGHTING FACILITIES

8.1 Adequate rescue and fire-fighting vehicles, equipment and personnel are provided at aerodromes available for international commercial air transport. Details concerning the equipment available at these aerodromes are given in AGA 2.

8.2 Temporary interruptions to rescue and fire-fighting service, or non-availability of such services, are made known by NOTAM.

8.3 Certificated Aerodromes (FAR 139)

Aerodromes serving certain air carriers under FAR, Part 139 are indicated by a CRF Index (i.e., CFR Index E), which relates to the availability of Crash, Fire, Rescue equipment (see AGA-0, Appendix One).

9. BIRD CONCENTRATIONS IN THE VICINITY OF AERODROMES

Animal and bird notices are not normally published in aerodrome remarks. Pilots should be aware that animals and birds are frequently found in the vicinity of aerodromes and should exercise due caution. However, selected bird notices may be published, but only after approval by the appropriate Regional Bird Hazard Group.

10. AIRPORT LIGHTING AIDS

10.1 Approach Light Systems (ALS)

10.1.1 Approach light systems provide the basic means for transition from instrument flight, to visual flight for landing. Operational requirements dictate the sophistication and configuration of the approach light system for a particular runway.

10.1.2 Approach light systems are a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of 2400-3000 feet for precision instrument runways and 1400-1500 feet for non-precision instrument runways. Some systems include sequenced flashing lights which appear to the pilot as a ball of light traveling towards the runway at high speed (twice each second).

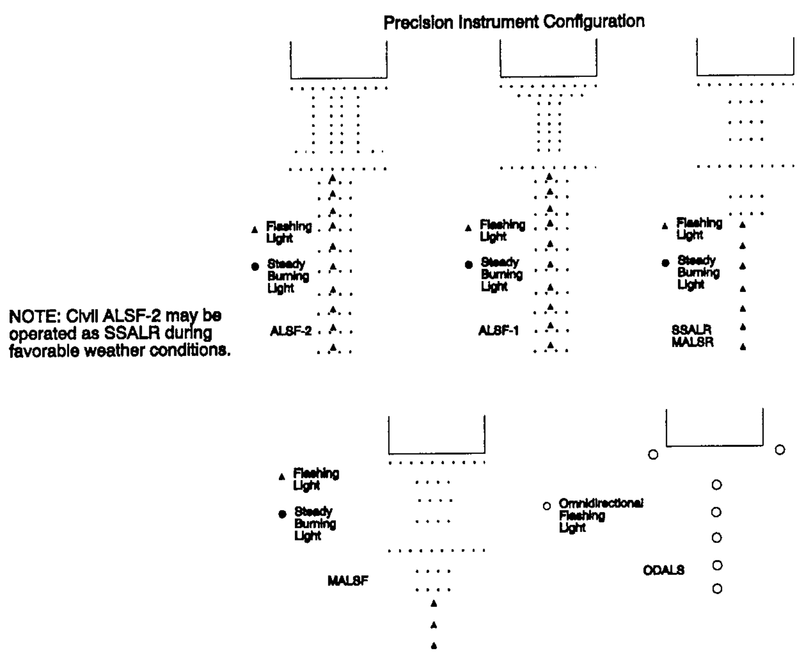


Figure 10.1(1) Precision and Non-precision Instrument Configurations

10.2 Visual Glideslope Indicators

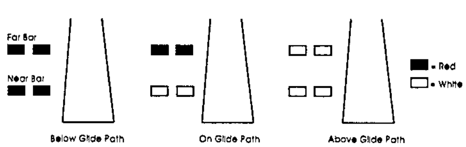
10.2.1 *Visual Approach Slope Indicator (VISI)*

10.2.1.1 The VASI is a system of lights so arranged to provide visual descent guidance information during the approach to a runway. These lights are visible from 3-5 miles during the day and up to 20 miles or more at night. The visual glide path of the VASI provides safe obstruction clearance within SYM 10 degrees of the extended runway centerline and to 4 nautical miles from the runway threshold. Descent, using the VASI, should not be initiated until the aircraft is visually aligned with the runway. Lateral course guidance is provided by the runway or runway lights.

10.2.1.2 VASI installations may consist of either 2, 4, 6, 12, or 16 light units arranged in bars referred to as near, middle, and far bars. Most VASI installations consist of two bars, near and far, and may consist of 2, 4, or 12 light units. Some airports have VASI'a consisting of three bars, near, middle, and far, which provide an additional visual glide path to accommodate high cockpit aircraft. This installation may consist of either 6 or 16 light units. VASI installations consisting of 2, 4, or 6 lights units are located on one side of the runway, usually the left. Where the installation consists of 12 or 16 light units, the light units are located on both sides of the runway.

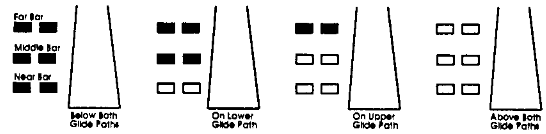
10.2.1.3 Two bar VASI installations provide one visual glide path which is normally set at 3 degrees. Three bar VASI installations provide two visual glide paths. The lower glide path is provided by the near and middle bars and is normally set at 3 degrees while the upper glide path, provided by the middle and far bars, in normally ¼ degree higher. This higher glide path is intended for use only by high cockpit aircraft to provide a sufficient threshold crossing height. Although normal glide path angles are three degrees, angles at some locations may be as high as 4.5 degrees to give proper obstacle clearance. Pilots of high performance aircraft are cautioned that use of VASI angles in excess of 3.5 degrees may cause an increase in runway length required for landing and rollout.

10.2.1.4 The basic principle of the VASI is that of color differentiation between red and white. Each light unit projects a beam of light having a white segment in the upper part of the beam and red segment in the lower part of the beam. The light units are arranged so that the pilot using the VASI's during an approach will see the combination of lights shown below.10.2.1.5 2-BAR VASI (4 light units shown)



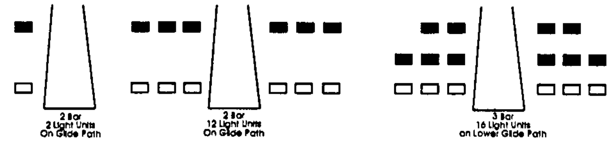
2-BAR VASI

10.2.1.6 3-BAR VASI (6 light units shown)



3-BAR VASI

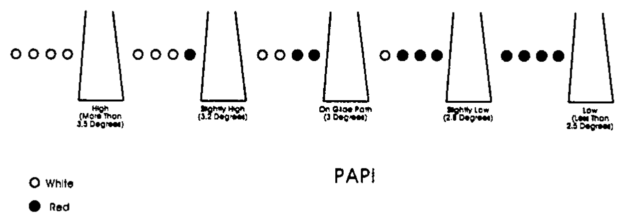
10.2.1.7 Other VASI Configurations



VASI VARIATIONS

10.2.2 *Precision Approach Path Indicator (PAPI)*

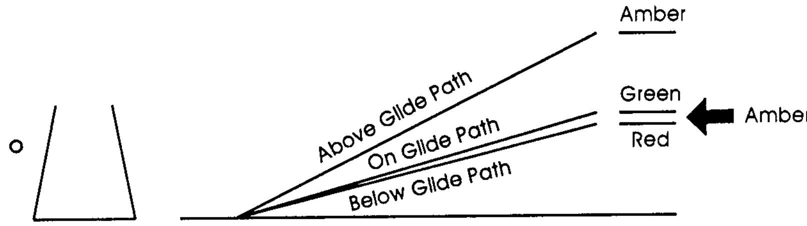
10.2.2.1 The precision approach path indicator (PAPI) uses light units similar to the VASI but are installed in a single row of either 2 or 4 lights units. These systems have an effective visual range of about 5 miles during the day and up to 20 miles at night. The row of light units is normally installed on the left side of the runway and the glide path indications are as follows;



PAPI

10.2.3 *Tri-color Systems*

10.2.3.1 Tri-color visual approach slope indicators normally consist of a single light unit, projecting a three-color visual approach path into the final approach area of the runway upon which the indicator is installed. The below glide path indication is red, the above glide path indication is amber, and the on glide path indication is green. These types of indicators have a useful range of approximately ½ to 1 mile during the day and up to 5 miles at night depending upon the visibility conditions.

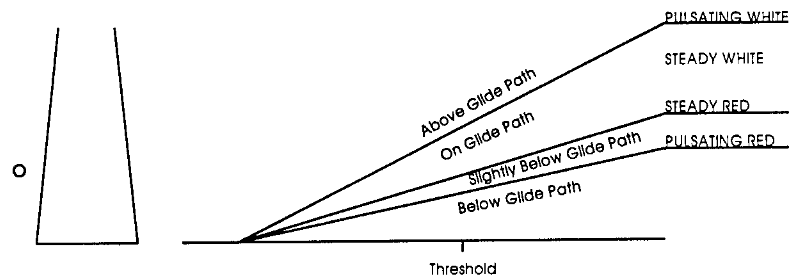


TRI-COLOR VISUAL APPROACH SLOPE INDICATOR

Caution: When the aircraft descends from green to red, the pilot may see a dark amber color during the transition from green to red.

10.2.4 *Pulsating Systems*

10.2.4.1 Pulsating visual approach slope indicators normally consist of a single light unit projecting a two-color visual approach path into the final approach area of the runway upon which the indicator is installed. The on glide path indication is a steady white light. The slightly below glide path indication is a steady red light. If the aircraft descends further below the glide path the red light starts to pulsate. The above glide path indication is a pulsating white light. The pulsating rate increases as the aircraft gets further above or below the desired glide slope. The useful range of the system is about four miles during the day and up to ten miles at night.

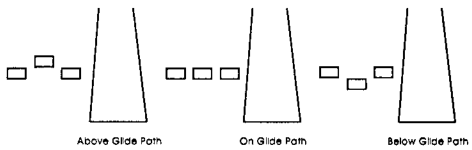


PULSATING VISUAL APPROACH SLOPE INDICATOR

Caution: When viewing the pulsaating visual approach slope indicators in the pulsating whiteor pulsating red sectors, it is possible to mistake this lighting aid for another aircraft or a ground vehicle. Pilots should exercise caution when using this type of system.

10.2.5 *Alignment of Elements Systems*

10.2.5.1 Alignment of elements systems are installed on some small general aviation airports and are a low cost system consisting of painted plywood panels, normally black and white or fluorescent orange. Some of these systems are lighted for night use. The useful range of these systems is approximately ¾ miles. To use the system the pilot positions his aircraft so the elements are in alignment. The glide path indications are as follows:



ALIGNMENT OF ELEMENTS

10.3 Reserved

10.4 Runway End Identifier Lights (REIL)

10.4.1 Runway End Identifier Lights are installed at many airfields to provide rapid and positive identification of the approach end of a particular runway. The system consists of a pair of synchronized flashing lights, one of which is located laterally on each side of the runway threshold facing the approach area. They are effective for:

A. Identification of a runway surrounded by a preponderance of other lighting.

B. Identification of a runway which lacks contrast with surrounding terrain.

C. Identification of a runway during reduced visibility.

10.5 Runway Edge Light Systems

10.5.1 Runway edge lights are used to outline the edges of runways during periods of darkness or restricted visibility conditions. These light systems are classified according to the intensity or brightness they are capable of producing; they are the High Intensity Runway Lights (HIRL), Medium Intensity Runway Lights (MIRL) and the Low Intensity Runway Lights (LIRL). The HIRL and MIRL systems have variable intensity controls, whereas the LIRL's normally have one intensity setting.

10.5.2 The runway edge lights are white except on instrument runways amber replaces white on the last 2,000 feet or half the runway length, whichever is less, to form a caution zone for landings. The lights marking the ends of the runway emit red light toward the runway to indicate the end of runway to a departing aircraft and emit green outward from the runway end to indicate the threshold to landing aircraft.

10.6 In-Runway Lighting

10.6.1 Touchdown zone lights and runway centerline lights are installed on some precision approach runways to facilitate landing under adverse visibility conditions. Taxiway turnoff lights may be added to expedite movement of aircraft from the runway.

10.6.1.1 Touchdown Zone Lighting (TDZL) — two rows of transverse light bars disposed symmetrically about the runway centerline in the runway touchdown zone. The system starts 100 feet from the landing threshold and extends to 3000 feet from the threshold or the midpoint of the runway, whichever is the lesser.

10.6.1.2 Runway Centerline Lighting (RCLS) — flush centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold and extending to within 75 feet of opposite end. Viewed from the landing threshold, the runway centerline lights are white until the last 3,000 feet of the runway. The white lights begin to alternate with the red for the next 2,000 feet, and for the last 1,000 feet of the runway, all lights are red.

10.6.1.3 Taxiway turnoff lights — flush lights spaced at 50-foot intervals, defining the curved path of aircraft travel from the runway centerline to a point on the taxiway. These lights are steady burning and emit green light.

10.7 Control of Lighting Systems

10.7.1 Operation of approach light systems and runway lighting is controlled by the control tower (ATCT). At some locations the FSS may control the lights where there is no control tower in operation.

10.7.2 Pilots may request that lights be turned on or off. Runway edge lights, in-pavement lights and approach lights also have intensity controls which may be varied to meet the pilots request. Sequenced flashing lights may be turned on and off. Some sequenced flashing system also have intensity control.

10.8 Pilot Control of Airport Lighting

10.8.1 Radio control of lighting is available at selected airports to provide airborne control of lights by keying the aircraft's microphone. Control of lighting system is often available at locations without specified hours for lighting or where there is no control tower or FSS, or when the control tower or FSS is closed (locations with a part-time tower or FSS). All lighting systems which are radio controlled at an airport, whether on a single runway or multiple runways, operate on the same radio frequency.

10.8.2 With FAA approved systems, various combinations of medium intensity approach lights, runway lights, taxiways lights, VASI and/or REIL may be activated by radio control. On runways with both approach lighting and runway lighting (runway edge lights, taxiway lights, etc.) systems, the approach lighting system takes precedence for air-to-ground radio control over the runway lighting system which is set at a predetermined intensity step, based on expected visibility conditions. Runways without approach lighting may provide radio controlled intensity adjustments of runway edge lights. Other lighting systems, including VASI, REIL, and taxiway lights, may be either controlled with the runway edge lights or controlled independently of the runway edge lights.

10.8.3 The control system consists of a 3-step control responsive to 7, 5, and/or 3 microphone clicks. This 3-step control will turn on lighting facilities capable of either 3-step, 2-step or 1-step operation. The 3-step and 2-step lighting facilities can be altered in intensity, while the 1-step cannot. All lighting is illuminated for a period of 15 minutes from the most recent time of activation and may not be extinguished prior to end of the 15 minute period (except for 1-step and 2-step REIL's which may be turned off when desired by keying the mike 5 or 3 times, respectively.)

10.8.4 Suggested use is to always initially key the mike 7 times; this assures that all controlled lights are turned on to the maximum available intensity. If desired, adjustment can then be made, where the capability is provided, to a lower intensity (or the REIL turned off) by keying 5 and/or 3 times. Due to the close proximity of airports using the same frequency, radio controlled lighting receivers may be set at a low sensitivity requiring the aircraft to be relatively close to activate the system. Consequently, even when lights are on, always key mike as directed when overflying an airport of intended landing or just prior to entering the final segment of an approach. This will assure the aircraft is close enough to activate the system and a full 15 minutes lighting duration is available. Approved lighting systems may be activated by keying the mike (within 5 seconds) as indicated below:

RADIO CONTROL SYSTEM

Key Mike	*Function*
7 times within 5 seconds	Highest intensity available.
5 times within 5 seconds	Medium or lower intensity (Lower REIL or REIL-Off)
3 times within 5 seconds	Lowest intensity available (Lower REIL or REIL-Off)

10.8.5 For all public use airports with FAA standard systems the Airport/Facility Directory contains the types of lighting, runway and the frequency that is used to activate the system. Airports with instrument approach procedures include data on the approach chart identifying the light system(s), the runway on which they are installed, and the frequency that is used to activate the system(s).

Note. — Although the CTAF is used to activate the lights at many airports, other frequencies may also be used. The appropriate frequency for activating the lights on the airport is provided in the Airport/Facility Directory and the Standard Instrument Approach Procedures publications. It is not identified on the sectional charts.

10.8.6 Where the airport is not served by an instrument approach procedure, it may have either the standard FAA approach control system or an independent type system of different specification installed by the airport sponsor. The Airport/Facility Directory contains descriptions of pilot controlled lighting systems for each airport having other than FAA approved systems, and explains the type lights, method of control, and operating frequency in clear text. (See Appendix 2.)

10.9 Airport (Rotating) Beacon

10.9.1 The airport beacon has a vertical light distribution to make it most effective from one up to ten degrees above the horizon; however, it can be seen well above and below this peak spread. The beacon may be an omnidirection capacitor-discharge device, or, it may rotate at a constant speed which produces the visual effect of flashes at regular intervals. Flashes may be one or two colors alternately.

The total number of flashes are:

A. 12 to 30 per minute for beacons marking airports, landmarks, and points on Federal airways:

B. 30 to 60 per minute for beacons marking heliports;

C. 12 to 60 per minute for hazard beacons.

10.9.2 The colors and color combinations of rotating beacons and auxiliary lights are basically:

White and Green	Lighted land airport
*Green alone	Lighted land airport
White and Yellow	Lighted water airport
*Yellow alone	Lighted water airport
Red alone	Hazard
Green, Yellow, and White	Lighted heliport
White	Hazard

*Green alone or yellow alone is used only in connection with a white-and-green or white-and-yellow beacon display, respectively.

10.9.3 Military airport beacons flash alternately white and green, but are differentiated from civil beacons by dual-peaked (two quick) white flashes between the green flashes.

10.9.4 In Class B, C, D and E surface areas, operation of the airport beacon during the hours of daylight indicates that the ground visibility is less than 3 miles and/or the ceiling is less than 1,000 feet. An ATC clearance in accordance with FAR Part 91 is required for landing, takeoff and flight in the traffic pattern. Pilots should not rely solely on the operation of the airport beacon to indicate if weather conditions are IFR or VFR. At locations with control towers, when controls are in the tower, ATC personnel turn the beacon on. At many airports, the airport beacon is turned on by a photoelectric cell or time clocks and ATC personnel can not control it. There is no regulatory requirement for daylight operation and it is the pilot's responsibility to comply with proper pre-flight planning in accordance with FAR Part 91.103

10.10 TAXIWAY LIGHTS

10.10.1 Taxiway Edge Lights. — Taxiway edge lights are used to outline the edges of taxiways during periods of darkness or restricted visibility conditions. These fixtures emit blue light.

Note. — At most major airports these lights have variable intensity settings and may be adjusted at pilot request or when deemed necessary by the controller.

10.10.2 Taxiway Centerline Lights. — Taxiway centerline lights are used to facilitate ground traffic under low visibility conditions. They are located along the taxiway centerline in a straight line on straight portions, on the centerline of curved portions, and along designated taxiing paths in portions of runways, ramp, and apron areas. Taxiway centerline lights are steady burning and emit green light.

11. AIR NAVIGATION AND OBSTRUCTION LIGHTING

11.1 Aeronautical Light Beacons

11.1.1 An aeronautical light beacon is a visual NAVAID displaying flashes of white and/or colored light to indicate the location of an airport, a heliport, a landmark, a certain point of a Federal airway in mountainous terrain, or an obstruction. The light used may be a rotating beacon or one or more flashing lights. The flashing lights may be supplemented by steady burning lights of lesser intensity.

11.1.2 The color or color combination display by a particular beacon and/or its auxiliary lights tell whether the beacon is indicating a landing place, landmark, point of the Federal airways, or an obstruction. Coded flashes of the auxiliary lights, if employed, further identify the beacon site.

11.2 Code Beacons and Course Lights

11.2.1 Code Beacons

11.2.1.1 The code beacon, which can be seen from all directions, is used to identify airports and landmarks and to mark obstructions. The number of code beacon flashes are:

Green coded flashes not exceeding 40 flashes or character elements per minute, or constant flashes 12 to 15 per minute, for identifying land airports.

Yellow coded flashes not exceeding 40 flashes or character elements per minute, or constant flashes 12 to 15 per minute, for identifying water airports.

Red flashes, constant rate, 12 to 40 flashes per minute, for marking hazards.

11.2.2 Course Lights

11.2.2.1 The course light, which can be seen clearly from only one direction, is used only with rotating beacons of the Federal Airway System; two course lights, back to back, direct coded flashing beams of light in either direction along the course of airway.

Note. — Airway beacons are remnants of the "lighted" airways which antedated the present electronically equipped Federal Airways System. Only a few of those beacons exist today to mark airway segments in remote mountain areas. Flashes in Morse Code identify the beacon site.

11.3 Obstruction Beacon

11.3.1 Obstructions are marked/lighted to warn airmen of their presence during daytime and nighttime conditions. They may be marked/lighted in any of the following combinations:

Aviation Red Obstruction Lights. Flashing aviation red beacons and steady burning aviation red lights during nighttime operation. Aviation orange and white paint is used for daytime marking.

High Intensity White Obstruction Lights. Flashing high intensity white lights during daytime with reduced intensity for twilight and nighttime operation. When this type is used, the marking of structures with red obstruction lights and aviation orange and white paint may be omitted.

Dual Lighting.A combination of flashing aviation red beacons and steady burning aviation red lights for nighttime operations and flashing high intensity white lights for daytime operation. Aviation orange and white paint may be omitted.

11.3.2 High intensity flashing white lights are being used to identify some supporting structures of overhead transmission line located across rivers, chasms, gorges, etc. These lights flash in a middle, top, lower light sequence at approximately 60 flashes per minute. The top light is normally installed near the top of the supporting structure, while the lower light indicates the approximate lower portion of the wire span. The lights are beamed towards the companion structure to identify the area of the wire span.

11.3.3 High intensity flashing white lights are also employed to identify tall structures, such as chimneys and towers, and obstructions to air navigation. The lights provide a 360 degree coverage about the structure at 40 flashes per minute and consist of from one to seven levels of lights depending upon the height of the structure. Where more than one level is used the vertical banks flash simultaneously.

11.4 Airway Beacons

Airway beacons are remnants of the "lighted" airways which antedated the present electronically equipped Federal Airways System. Only a few of these beacons exist today to mark airway segments in remote mountain areas. Flashes in Morse Code identify the beacon site.

11.5 Airport Lead-in Lighting System (LDIN)

11.5.1 The lead-in lighting system consists of series of flashing lights installed at or near ground level to describe the desired course to a runway or final approach. Each group of lights is positioned and aimed so as to be conveniently sighted and followed from the approaching aircraft under conditions at or above approach minimums under consideration. The system may be curved, straight, or combination thereof, as required. The lead-in lighting system may be terminated at any approved approach lighting system, or it may be terminated at a distance from the landing threshold which is compatible with authorized visibility minimums permitting visual reference to the runway environment.

11.5.2 The outer portion uses groups of lights to mark segments of the approach path beginning at a point within easy visual range of a final approach fix. These groups are spaced close enough together (approximately one mile) to give continuous lead-in guidance. A group consists of at least three flashing lights in a linear or cluster configuration and may be augmented by steady burning lights where required. When practicable, groups flash in sequence toward runways. Each system is designed to suit local conditions and to provide the visual guidance intended. The design of all LDIN is compatible with the requirements of U.S. Standards for Terminal Instrument Procedures (TERPS) where such procedures are applied for establishing instrument minimums.

12. AIRPORT MARKING AIDS AND SIGNS

12.1 GENERAL

12.1.1 Airport pavement markings and signs provide information that is useful to a pilot during takeoff, landing, and taxiing.

12.1.2 Uniformity in airport markings and signs from one airport to another enhances safety and improves efficiency. Pilots are encouraged to work with the operators of the airports they use to achieve the marking and sign standards described in this section.

12.1.3 Pilots who encounter ineffective, incorrect, or confusing markings or signs on an airport should make the operator of the airport aware of the problem. These situations may also be reported under the Aviation Safety Reporting Program as described in SAR 4.1. Pilots may also report these situations to the FAA regional airports division.

12.1.4 The markings and signs described in this section of the AIM reflect the current FAA recommended standards.

Note.— Refer to AC 150/5340-1 Standards for Airport Markings and to AC 150/5340-18 Airport Sign Standards.

12.2 Airport Pavement Markings

12.2.1 *General:* For the purpose of this presentation the Airport Pavement Marking have been grouped into the four areas:

12.2.1.1 Runway Markings.

12.2.1.2 Taxiway Markings.

12.2.1.3 Holding Position Markings.

12.2.1.4 Other Markings.

12.2.2 *Marking Colors:* Markings for runways are white. Markings defining the landing area on a heliport are also white except for hospital heliports which use a red "H" on a white cross. Markings for taxiways, areas not intended for use by aircraft (closed and hazardous areas), and holding positions (even if they are on a runway) are yellow.

12.3 Runway Markings

12.3.1 *General:* There are three types of markings for runways: visual, non precision instrument and precision instrument. Table 12.3(1) identifies the marking elements for each type of runway and Table 12.3(2) identifies runway threshold markings.

Table 12.3.(1) Runway Marking Elements

Marking Element	Visual Runway	Nonprecision Instrument Runway	Precision Instrument Runway
Designation (par. 6)	X	X	X
Centerline (par. 7)	X	X	X
Threshold (par. 8)	X[1]	X	X
Aiming Point (par. 9)	X[2]	X	X
Touchdown Zone (par. 10)			X
Side Stripes (par. 11)			

[1] On runways used, or intended to be used, by international commercial transport.
[2] On runways 4,000 feet (1200 m) or longer used by jet aircraft.

12.3.2 *Runway Designators:* Runway numbers and letters are determined from the approach direction. The runway number is the whole number nearest one-tenth the magnetic azimuth of the centerline of the runway, measured clockwise from the magnetic north. The letters, differentiate between left (L), right (R), or center (C), parallel runways, as applicable:

12.3.2.1 For two parallel runways "L" "R"

12.3.2.2 For three parallel runways "L" "C" "R"

12.3.3 *Runway Centerline Marking:* The runway centerline identifies the center of the runway and provides alignment guidance during takeoff and landings. The centerline consists of a line of uniformly spaced stripes and gaps.

12.3.4 *Runway Aiming Point Marking:* The Aiming Point marking serves as a visual aiming point for a landing aircraft. these two rectangular markings consists of a broad white stripe located on each side of the runway centerline and approximately 1,000 feet from the landing threshold, as shown in Figure 12.3(1) Precision Instrument Runway Markings.

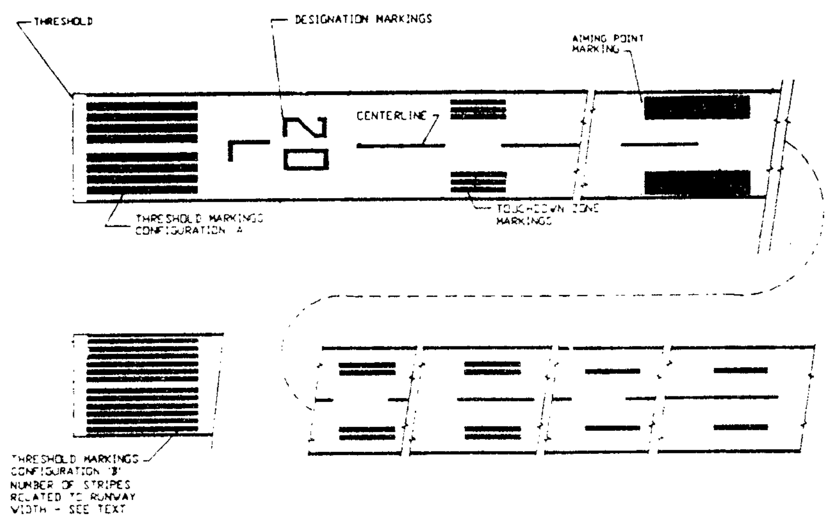


Figure 12.3(1) Precision Instrument Runway Markings

12.3.5 *Runway Touchdown Zone Markers:* The touchdown zone markings identify the touchdown zone for landing operations and are coded to provide distance information in 500 feet (150m) increments. These markings consist of groups of one, two, and three rectangular bars symmetrically arranged in pairs about the runway centerline, as shown in Figure 12.3(1). Precision Instrument Runway Markings. For runways having touchzone markings on both ends, those pairs of markings which extend to within 900 feet (270m) of the midpoint between the thresholds are eliminated.

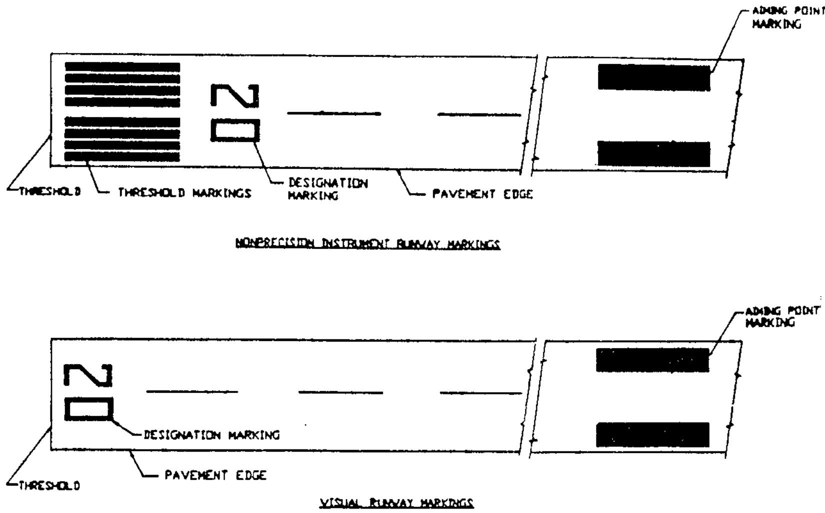


Figure 12.3(2) Nonprecision Instrument Runway and Visual Runway Markings

12.3.6 *Runway Side Strip Marking:* Runway side stripes delineate the edges of the runway. They provide a visual contrast between runway and the abutting terrain or shoulders. Side stripes consist of continuous white stripes located, on each side of the runway as shown in Figure 12.3(5).

12.3.7 *Runway Shoulder Markings:* Runway shoulder stripes may be used to supplement runway side stripes to identify pavement areas contiguous to the runway sides that are not intended for use by aircraft. Runway Shoulder stripes are Yellow. (See Figure 12.3(3)

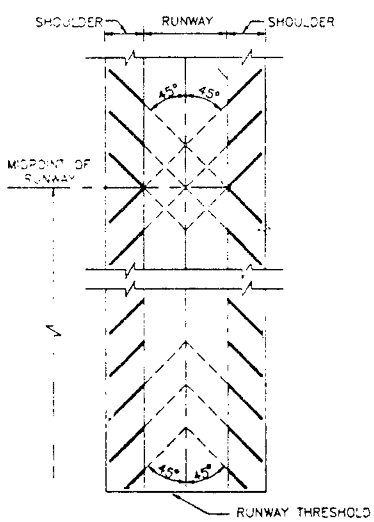


Figure 12.3(3) Runway Shoulder Markings

12.3.8 *Runway Threshold Markings:* Runway threshold markings come in two configurations. They either consist of eight longitudinal stripes of uniform dimensions disposed symmetrically about the runway centerline, as shown in Figure 12.3(1), or the number of stripes is related to the runway width as indicated in Table 12.3(2). A threshold marking helps identify the beginning of the runway that is available for landing. In some instances the landing threshold may be relocated or displaced.

12.3.8.1 Relocated Threshold. Sometimes construction, maintenance, or other activities require the threshold to be relocated towards the departure end of the runway. In these cases, where the relocation is temporary, a notam should be issued by the airport operator identifying the portion of the runway that is closed, e.g., First 2,000 feet of Runway 24 closed. Because the duration of the relocation can vary from a few hours to several months, methods for identifying the relocated threshold vary. One common practice is to use a ten feet wide white threshold bar across the width of the runway. Although the runway lights in the area between the old threshold and relocated threshold will not be illuminated, the runway markings in this area may or may not be obliterated, removed, or covered.(See Figure 12.3(4).

12.3.8.2 Displaced Threshold: A displaced threshold is a threshold located at a point on the runway other than the designated beginning of the runway. A ten feet wide white threshold bar is located across the width of the runway at the displaced threshold. White arrows are located along the centerline in the area between the beginning of the runway and displaced threshold. White arrow heads are located across the width of the runway just prior to the threshold bar, as shown in Figure 12.3(5).

Table 12.3(2) Runway Threshold Markings

Runway Width	Number of Stripes
60 feet (18 m)	4
75 feet (23 m)	6
100 feet (30 m)	8
150 feet (45 m)	12
200 feet (60 m)	16

12.3.9 *Runway Threshold BAR:* A threshold bar delineates the beginning of the runway that is available for landing when the threshold has been relocated or displaced. A threshold bar is 10 feet (3m) in width and extends across the width of the runway, as shown in Figure 12.3(5).

12.3.9 *Demarcation Bar:* A demarcation bar delineates a runway with a displaced threshold from a blast pad, stopway or taxiway that precedes the runway. A demarcation bar is 3 feet (1m) wide and yellow, since it is not located on the runway as shown in Figure 12.3(6).

12.3.10 *Chevrons:* These markings are used to show pavement areas aligned with the runway that are unusable for landing, takeoff, and taxiing. Chevrons are yellow. (See Figure 12.3(7).

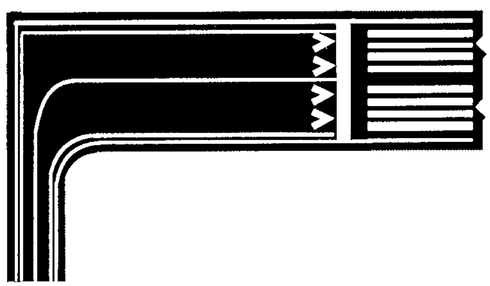


Figure 12.3(4) Relocated Threshold with Markings for taxiway Aligned with Runway

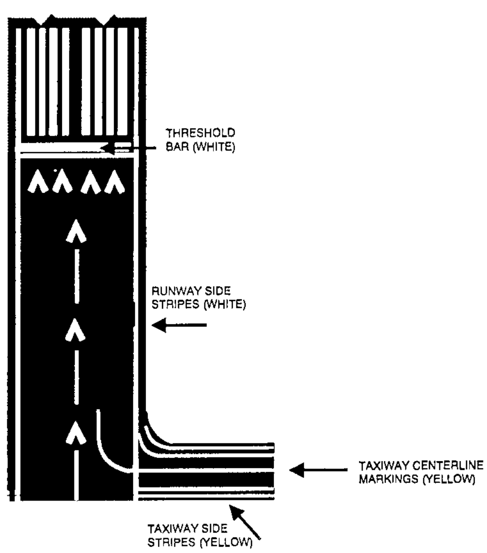


Figure 12.3(5) Displaced Threshold Markings

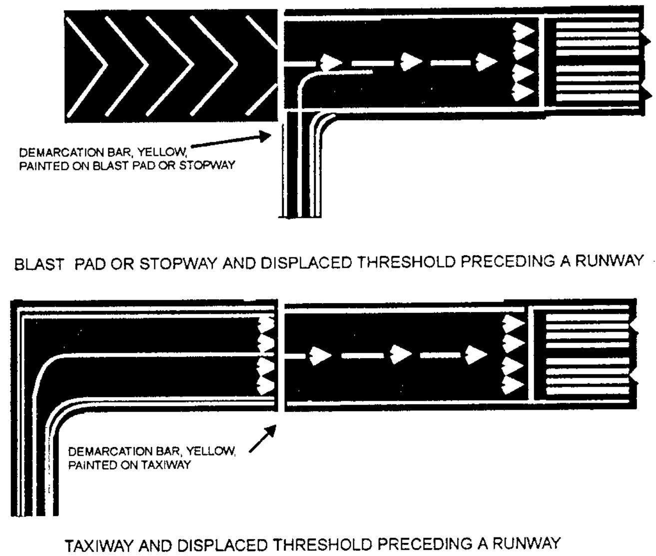


Figure 12.3(6) Markings for Blast Pad or Stopway or Taxiway Preceding a Displaced Threshold

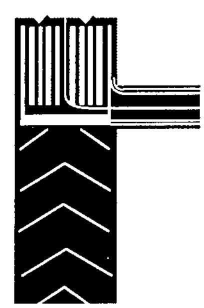


Figure 12.3(7) Markings for Blast Pads and Stopways

12.4 Taxiway Markings

12.4.1 *General:* All taxiways should have centerline markings, (See Paragraph 12.4.2), and runway holding position markings whenever they intersect a runway. Taxiway edge markings are present whenever there is a need to separate the taxiway from a pavement that is not intended for aircraft use or to delineate the edge of the taxiway. Taxiways may also have shoulder markings and holding position markings for Instrument Landing

System/Microwave Landing System (ILS/MLS) critical areas, and taxiway/taxiway intersection markings.

12.4.2 *Taxiway Centerline:* The taxiway centerline is a single continuous yellow line, 6 inches (15 cm) to 12 inches (30 cm) in width. This provides a visual cue to permit taxiing along a designated path. Ideally the aircraft should be kept centered over this line during taxi to ensure wing-tip clearance. See Figure 12.4(1)

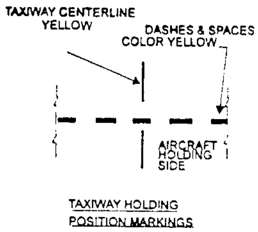


Figure 12.4(1) Taxiway Centerline

12.4.3 *Taxiway Edge Markings:* Taxiway edge markings are used to define the edge of the taxiway. They are primarily used when the taxiway edge does not correspond with the edge of the pavement. There are two types of markings depending upon whether the aircraft is suppose to cross the taxiway edge:

12.4.3.1 Continuous Markings.—These consist of a continuous double yellow line, with each line being at least 6 inches (15 cm) in width spaced 6 inches (15 cm) apart. They are used to define the taxiway edge from the shoulder or some other abutting paved surface not intended for use by aircraft.

12.4.3.2 Dashed Markings.—These markings are used when there is an operational need to define the edge of a taxiway or taxilane on a paved surface where the adjoining pavement to the taxiway edge is intended for use by aircraft. e.g., an apron. Dashed taxiway edge markings consist of a broken double yellow line, with each line being at least 6 inches (15 cm) in width, spaced 6 inches (15 cm) apart (edge to edge). These lines are 15 feet (4.5 m) in length with 25 foot (7.5 m) gaps. See Figure 12.4(2)

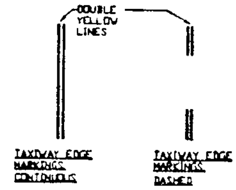


Figure 12.4(2) Dashed Markings

12.4.4 *Taxi Shoulder Markings:* Taxiways, holding bays, and aprons are sometimes provided with paved shoulders to prevent blast and water erosion. Although shoulders may have the appearance of full strength pavement they are not intended for use by aircraft, and may be unable to support an aircraft. Usually the taxiway edge marking will define this area. Where conditions exist such as islands or taxiway curves that may cause confusion as to which side of the edge stripe is for use by aircraft, taxiway shoulder markings may be used to indicate the pavement is unusable. Taxiway shoulder markings are yellow. See Figure 12.4(3)

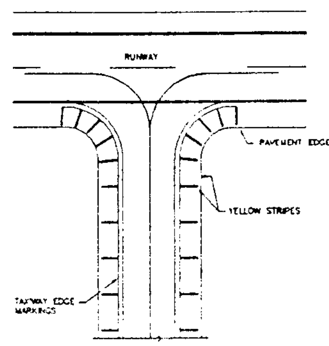


Figure 12.4(3) Taxi Shoulder Markings

12.4.5 *Surface Painted Taxiway Direction Signs:* Surface painted taxiway direction signs have a yellow background with a black inscription, and are provided when it is not possible to provide taxiway direction signs at intersections, or when necessary to supplement such signs. These markings are located adjacent to the centerline with signs indicating turns to the left being on the left side of the taxiway centerline and signs indicating turns to the right being on the right side of the centerline. See Figure 12.4(4)

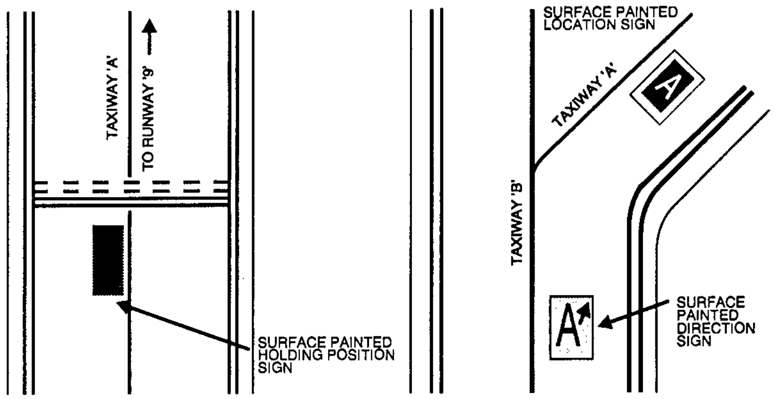


Figure 12.4(4) Surface Painted Signs

12.4.6 *Surface Painted Location Signs:* Surface painted location signs have a black background with a yellow inscription. When necessary, these markings are used to supplement location signs located along side the taxiway and assist the pilot in confirming the designation of the taxiway on which the aircraft is located. These markings are located on the right side of the centerline. See Figure 12.4(4)

12.4.7 *Geographic Position Markings:* These markings are located at points along low visibility taxi routes designated in the airport's Surface Movement Guidance Control System (SMGCS) plan. They are used to identify the location of taxiing aircraft during low visibility operations. Low visibility operations are those that occur when the runway visible range (RVR) is below 1200 feet (360m). They are positioned to the left of the taxiway centerline in the direction of taxiing. See Figure 12.4(5). The Geographic position marking is a circle comprised of an outer black ring contiguous to a white ring with a pink circle in the middle. When installed on asphalt or other dark-colored pavements, the white ring and the black ring are reversed, i.e., the white ring becomes the outer ring and the black ring becomes the inner ring. It is designated with either a number or a number and letter. The number corresponds to the consecutive position of the marking on the route.

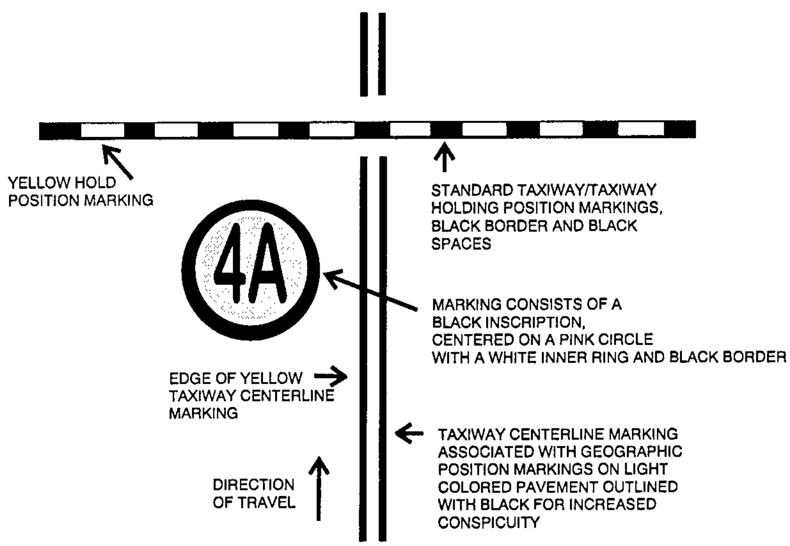


Figure 12.4(5) Geographic Position Markings

12.5 Holding Position Markings

12.5.1 *Runway Holding Position Markings:* For runways these markings indicate where an aircraft is supposed to stop. They consist of four yellow lines two solid and two dashed, spaced six inches apart and extending across the width of the taxiway or runway. The solid lines are always on the side where the aircraft is to hold. There are three locations where runway holding position markings are encountered.

12.5.1.1 Runway Holding Position Markings on Taxiways.— These markings identify the locations on a taxiway where an aircraft is supposed to stop when it does not have clearance to proceed onto the runway. The runway holding position markings are shown in Figure 12.5(1).

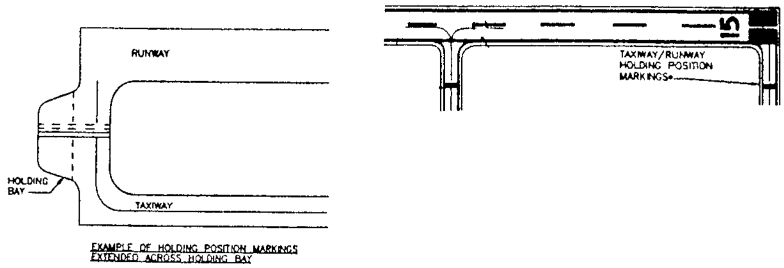


Figure 12.5(1) Runway Holding Position Markings on Taxiways

12.5.1.1.1 When instructed by ATC " HOLD SHORT OF (runway "XX")" the pilot should stop so no part of his aircraft extends beyond the holding position marking. When approaching the holding position marking, a pilot should not cross the marking without ATC clearance at a controlled airport or without making sure of adequate separation from other aircraft at uncontrolled airports. An aircraft exiting a runway is not clear of the runway until all parts of the aircraft have crossed the applicable holding position marking.

12.5.1.2 Runway Holding Position Markings on Runways.— These markings are installed on runways only if the runway is normally used by air traffic control for "land, hold short" operations or taxiing operations and have operational significance only for those two types of operations. A sign with a white inscription on a red background is installed adjacent to these holding position markings (See Figure 12.5(2)).

12.5.1.2.1 The hold position markings are placed on runways prior to the intersection with another runway, or some designated point. Pilots receiving instructions " Clear to Land, Runway "XX" from Air Traffic Control are authorized to use the entire landing length of the runway and should disregard any holding position markings located on the runway. Pilots receiving and accepting instructions "Clear to Land Runway "XX", Hold Short of Runway "yy" from Air Traffic Control must either exit Runway "XX", or stop at the holding position prior to Runway "yy".

12.5.1.3 Taxiways Located in Runway Approach Areas.— These markings are used at some airports where it is necessary to hold an aircraft on a taxiway located in the approach or departure area of a runway so that the aircraft does not interfere with the operations on that runway. This marking is co-located with the Runway approach area holding position sign. (See Paragraph 12.5.3 and Figure 12.5(3)).

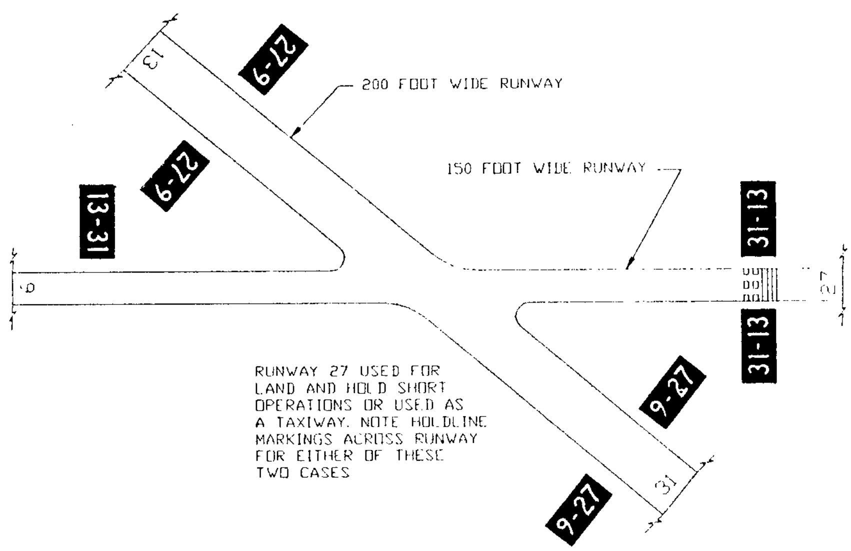


Figure 12.5(2) Runway Holding Position Markings on Runways

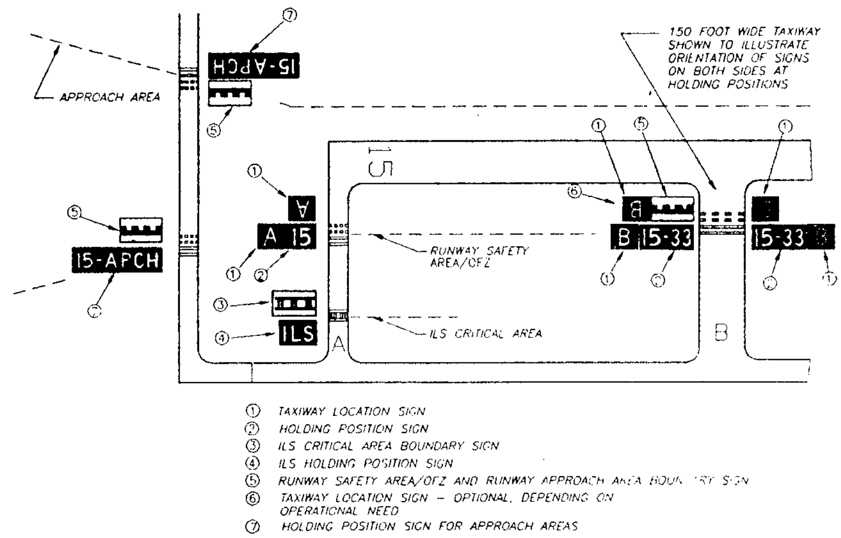


Figure 12.5(3) Taxiways Located in Runway Approach Area

12.5.2 *Holding Position Markings for Instrument Landing System (ILS)*—Holding position markings for ILS/MLS critical areas consist of two yellow solid lines spaced two feet apart connected by pairs of solid lines spaced ten feet apart extending across the width of the taxiway as shown. (See Figure 12.5(4) [Holding Position Markings: ILS Critical Areas]). A sign with an inscription in white on a red background is installed adjacent to these hold position markings.

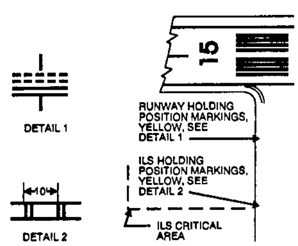


Figure 12.5(4) Holding Position Markings: ILS Critical Area

12.5.2.1 When the ILS critical area is being protected (ref para 4.6.12) the pilot should stop so no part of his aircraft extends beyond the holding position marking. When approaching the holding position marking, a pilot should not cross the marking without ATC clearance. ILS critical area is not clear until all parts of the aircraft have crossed the applicable holding position marking.

12.5.3 *Holding Position Markings for Taxiway/Taxiway Intersections*—Holding position markings for taxiway/taxiway intersections consist of a single dashed line extending across the width of the taxiway as shown. (See Figure 12.5(5). They are installed on taxiways where air traffic control normally holds aircraft short of a taxiway intersection.

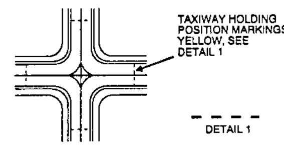


Figure 12.5(5) Holding Position Markings: Taxiway/ Taxiway Intersections

12.5.3.1 When instructed by ATC "HOLD SHORT OF (taxiway)" the pilot should stop so no part of his aircraft extends beyond the holding position marking. When the marking is not present the pilot should stop the aircraft at a point which provides adequate clearance from an aircraft on the intersecting taxiway.

12.5.4 *Surface Painted Holding Position Signs*—Surface painted holding position signs have a red background with a white inscription and supplement the signs located at the holding position. This type of marking is normally used where the width of the holding position on the taxiway is greater than 200 feet (60m). It is located to the left side of the taxiway centerline on the holding side and prior to the holding position marking. See Figure 12.5(4).

12.6 Other Markings

12.6.1 *Vehical Roadway Markings:* The vehicle roadway markings are used when necessary to define a pathway for vehicle operations on or crossing areas that are also intended for aircraft. These markings consist of a white solid line to delineate each edge of the roadway and a dashed line to separate lanes within the edges of the roadway. In lieu of the solid lines, zipper markings may be used to delineate the edges of the vehicle roadway. (See Figure 12.6(1). Vehicle Roadway Markings) Details of the zipper markings are shown in Figure 12.6(2).

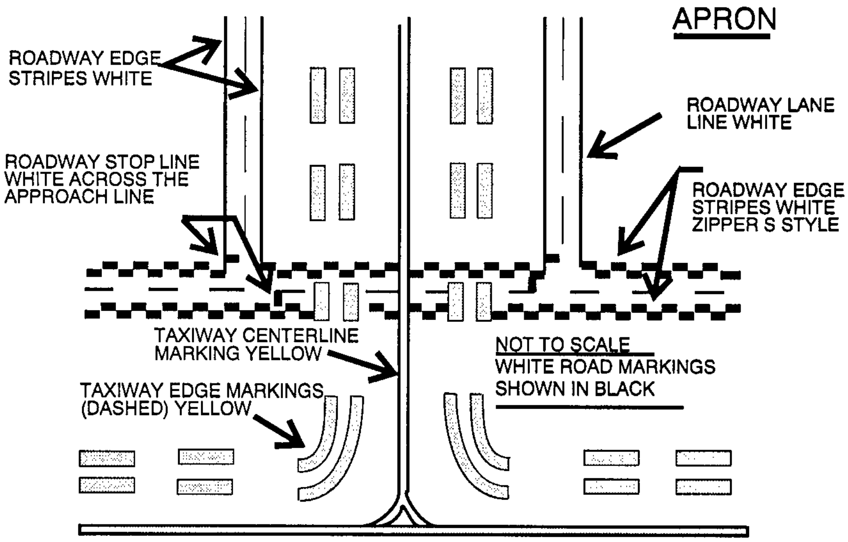


Figure 12.6(1) Vehicle Roadway Markings

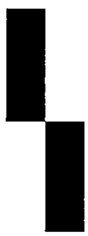


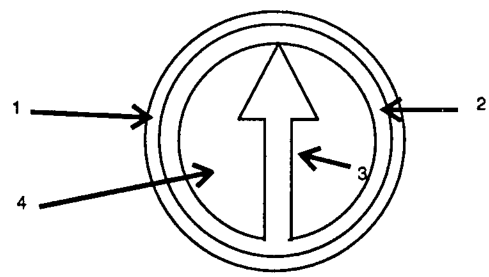
Figure 12.6(2) Roadway Edge Stripes, White, Zipper Style

12.6.2 *VOR Receiver Checkpoint Markings:* The VOR receiver checkpoint marking allows the pilot to check aircraft instruments with navigational aid signals. It consists of a painted circle with an arrow in the middle; the arrow is aligned in the direction of the checkpoint azimuth. This marking, and an associated sign, is located on the airport apron or taxiway at a point selected for easy access by aircraft but where other airport traffic is not be unduly obstructed. (See Figure 12.6(3)).

12.6.2.1 The associated sign contains the VOR station identification letter and course selected (published) for the check, the words "VOR CHECK COURSE," and DME data (when applicable). The color of the letters and numerals are black on a yellow background.

Example:

DCA 176-356
VOR CHECK COURSE
DME XXX



1. WHITE
2. YELLOW
3. YELLOW ARROW ALIGNED TOWARD THE FACILITY
4. INTERIOR OF CIRCLE BLACK (CONCRETE SURFACE ONLY)
5. CIRCLE MAY BE BORDERED ON INSIDE AND OUTSIDE WITH 6' BLACK BAND IF NECESSARY FOR CONTRAST

Figure 12.6(3) Ground Receiver Checkpoint Markings

12.6.3 *Non-Movement Area Boundry Markings:* These markings delineate the movement area, i.e., area under air traffic control. These markings are yellow and located on the boundary between the movement and non-movement area. The non-movement area boundary markings consist of two yellow lines (one solid and one dashed) 6 inches (15cm) in width. The solid line is located on the nonmovement area side while the dashed yellow line is located on the movement area side. The non-movement boundary marking area is shown in Figure 12.6(4).

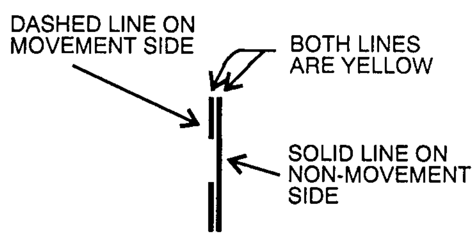


Figure 12.6(4) Non-Movement Area Boundry Markings

12.6.4 *Marking and Lighting of Permanently Closed Runways and Taxiways:* For runways and taxiways which are permanently closed, the lighting circuits will be disconnected. The runway threshold, runway designation, and touchdown markings are obliterated and yellow crosses are placed at each end of the runway and at 1,000 foot intervals. See Figure 12.6(5).

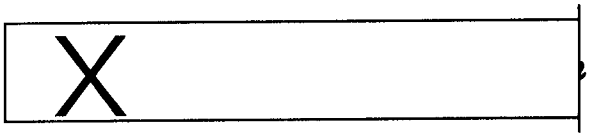


Figure 12.6(5) Closed or Temporarily Closed Runway and Taxiway Markings

12.6.5 *Temporarily Closed Runways and Taxiways:* To provide a visual indication to pilots that a runway is temporarily closed, crosses are placed on the runway only at each end of the runway. The crosses are yellow in color. See Figure 12.6(5).

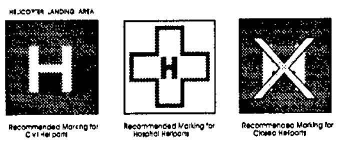


Figure 12.6(6) Helicopter Landing Areas

12.6.5.1 A raised lighted yellow cross may be placed on each runway end in lieu of the markings described in the paragraph "e" to indicate the runway is closed.

12.6.5.2 A visual indication may not be present depending on the reason for the closure, duration of the closure, airfield configuration and the existence and the hours of operation of an airport traffic control Tower. Pilots should check Notams and the Automated Terminal Information System (ATIS) for local Runway and taxiway closure information.

12.6.5.3 Temporarily closed taxiways are usually treated as hazardous areas, in which no part of an aircraft may enter, and are blocked with barricades. However, as an alternative a yellow cross may be installed at each entrance to the taxiway.

12.6.6 *Helicopter Landing Areas:* The markings illustrated in Figure 12.6(6) (Helicopter Landing Areas) are used to identify the landing and takeoff area at a public use heliport and hospital heliport. The letter "H" in the markings is oriented to align with the intended direction of approach. Figure 12.6(6) also depicts the markings for a closed airport.

12.7 Airport Signs

12.7.1 There are six types of signs installed on airfields: mandatory instruction signs, location signs, direction signs, destination signs, information signs, and runway distance remaining signs. The characteristics and use of these signs are discussed below.

Note. — Refer to Advisory Circular-150/5340-18, Standards for Airport Sign Systems for detailed information on airport signs.

12.8 Mandatory Instruction Signs

12.8.1 These signs have a red background with a white inscription and are used to denote:

(a) An entrance to a runway or critical area and;

(b) Areas where an aircraft is prohibited from entering.

Typical mandatory signs and applications are:

12.8.2 Runway Holding Position Sign — This sign is located at the holding position on taxiways that intersect a runway or on runways that intersect other runways. The inscription on the sign contains the designation of the intersecting runway as shown in **Figure 12.8(1).** The runway numbers on the sign are arranged to correspond to the respective runway threshold. For example, "15-33" indicates that the threshold for Runway 15 is to the left and the threshold for Runway 33 is to the right.

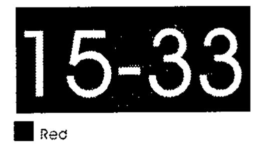


Figure 12.8(1).—Runway Holding Position Sign

12.8.2.1 On taxiways that intersect the beginning of the takeoff runway, only the designation of the takeoff runway may appear on the sign as shown in **Figure 12.8(2),** while all other signs will have the designation of both runway directions.

Figure 12.8(2) Holding Position Sign at Beginning of Takeoff Runway

12.8.2.2 If the sign is located on a taxiway that intersects the intersection of two runways, the designations for both runways will be shown on the sign along with arrows showing the approximate alignment of each runway as shown in **Figure 12.8(3).** In addition to showing the approximate runway alignment, the arrow indicates the direction **to the threshold of the runway** whose designation is immediately next to the arrow.

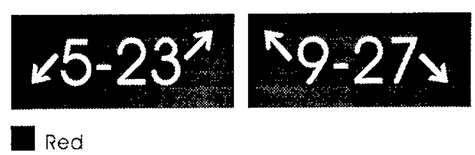


Figure 12.8(3).—Holding Position Sign for a Taxiway that Intersects the Intersection of Two Runways

12.8.2.3 A runway holding position sign on a taxiway will be installed adjacent to holding position markings on the taxiway pavement. On runways, holding position markings will be located only on the runway pavement adjacent to the sign, if the runway is normally used by air traffic control for "Land, Hold Short" operations or as a taxiway. The holding position markings are described in Paragraph 12.2.13.1.

12.8.3 Runway Approach Area Holding Position Sign — At some airports, it is necessary to hold an aircraft on a taxiway located in the approach or departure area for a runway so that the aircraft does not interfere with operations on that runway. In these situations a sign with the designation of the approach end of the runway followed by a "dash" (-) and letters "APCH" will be located at the holding position on the taxiway. Holding position markings in accordance with Paragraph 12.2.13.1 will be located on the taxiway pavement. An example of this sign is shown in **Figure 12.8(4).** In this example, the sign may protect the approach to Runway 15 and/or the departure for Runway 33.

■ Red

Figure 12.8(4).—Holding Position Sign for a Runway Approach Area

12.8.4 ILS Critical Area Holding Position Sign — At some airports, when the instrument landing system is being used, it is necessary to hold an aircraft on a taxiway at a location other than the holding position described in Paragraph 12.2.13.1. In these situations the holding position sign for these operations will have the inscription "ILS" and be located adjacent to the holding position marking on the taxiway described in Paragraph 12.2.13.2. An example of this sign is shown in **Figure 12.8(5).**

■ Red

Figure 12.8(5).—Holding Position Sign for ILS Critical Area

12.8.5 No Entry Sign — This sign, shown in **Figure 12.8(6),** prohibits an aircraft from entering an area. Typically, this sign would be located on a taxiway intended to be used in only one direction or at the intersection of vehicle roadways with runways, taxiways or aprons where the roadway may be mistaken as a taxiway or other aircraft movement surface.

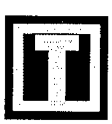
Note. — The holding position sign provides the pilot with a visual cue as to the location of the holding position marking. The operational significance of holding position markings are described in the notes for Paragraph 12.2.13

■ Red

Figure 12.8(6).—Sign Prohibiting Aircraft Entry into an Area

12.9 Location Signs

12.9.1 Location signs are used to identify either a taxiway or runway on which the aircraft is located. Other location signs provide a visual cue to pilots to assist them in determining when they have exited an area. The various location signs are described below.



□ Yellow

Figure 12.9(1).—Taxiway Location Sign

12.9.2 Taxiway Location Sign. This sign has a black background with a yellow inscription and yellow border as shown in **Figure 12.9(1).** The inscription is the designation of the taxiway on which the aircraft is located. These signs are installed along taxiways either by themselves or in conjunction with direction signs **(See Figure 12.10(1))** or runway holding position signs **(See Figure 12.9(2)).**

□ Yellow ■ Red

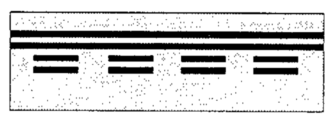
Figure 12.9(2).—Taxiway Location Sign Collocated with Runway Holding Position Sign

12.9.3 Runway Location Sign. This sign has a black background with a yellow inscription and yellow border as shown in **Figure 12.9(3).** The inscription is the designation of the runway on which the aircraft is located. These signs are intended to complement the information available to pilots through their magnetic compass and typically are installed where the proximity of two or more runways to one another could cause pilots to be confused as to which runway they are on.

□ Yellow

Figure 12.9(3).—Runway Location Sign

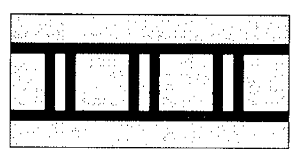
12.9.4 Runway Boundary Sign. This sign has a yellow background with a black inscription with a graphic depicting the pavement holding position marking as shown in **Figure 12.9(4).** This sign, which faces the runway and is visible to the pilot exiting the runway, is located adjacent to the holding position marking on the pavement. The sign is intended to provide pilots with another visual cue which they can use as a guide in deciding when they are "clear of the runway."



□ Yellow

Figure 12.9(4).—Runway Boundry Sign

12.9.5 ILS Critical Area Boundary Sign. This sign has a yellow background with a black inscription with a graphic depicting the ILS pavement holding position marking as shown in **Figure 12.9(5).** This sign is located adjacent to the ILS holding position marking on the pavement and can seen by pilots leaving the critical area. The sign is intended to provide pilots with another visual cue which they can use as a guide in deciding when they are "clear of the ILS critical area."



□ Yellow

Figure 12.9(5).—ILS Critical Area Boundry Sign

12.10 Direction Signs

12.10.1 Direction signs have a yellow background with a black inscription. The inscription identifies the designation(s) of the intersecting taxiway(s) leading out of intersection that a pilot would normally be expected to turn onto or hold short of. Each designation is accompanied by an arrow indicating the direction of the turn.

12.10.2 Except as noted in subparagraph 12.10.6, each taxiway designation shown on the sign is accompanied by only one arrow. When more than one taxiway designation is shown on the sign each designation and its associated arrow is separated from the other taxiway designations by either a vertical message divider or a taxiway location sign as shown in **Figure 12.10(1).**

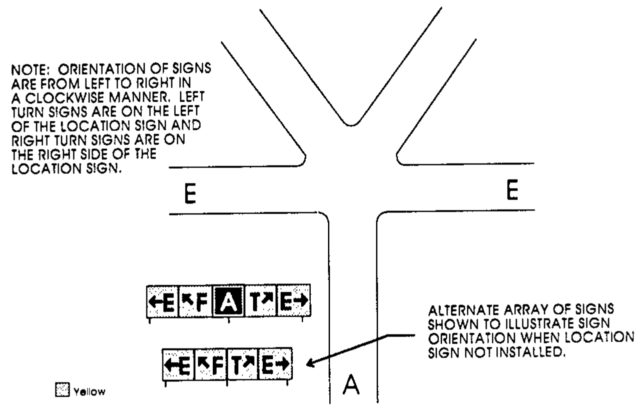


Figure 12.10(1).—Direction Sign Array with Location Sign on Far Side of Intersection

12.10.3 Direction signs are normally located on the left prior to the intersection. When used on a runway to indicate an exit, the sign is located on the same side of the runway as the exit. **Figure 12.10(2)** shows a direction sign used to indicate a runway exit.

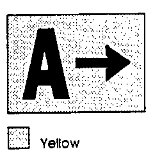


Figure 12.10(2).—Direction Sign for Runway Exit

12.10.4 The taxiway designations and their associated arrows on the sign are arranged clockwise starting from the first taxiway on the pilot's left, see **Figure 12.10(1).**

12.10.5 If a location sign is located with the direction signs it is placed so that the designations for all turns to the left will be to the left of the location sign; the designations for continuing straight ahead or for all turns to the right would be located to the right of the location sign. **See Figure 12.10(1).**

12.10.6 When the intersection is comprised of only one crossing taxiway, it is permissible to have two arrows associated with the crossing taxiway as shown in **Figure 12.10(3).** In this case the location sign is located to the left of the direction sign.

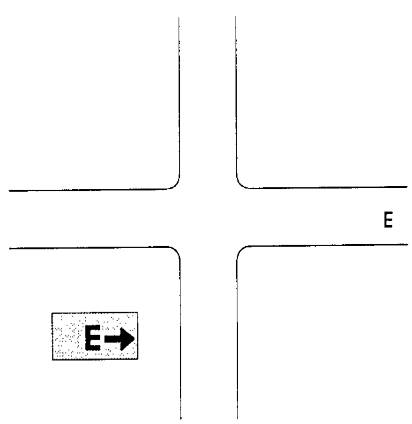


Figure 12.10(3).—Direction Sign Array for a Simple Intersection

12.11 Destination Signs

12.11.1 Destination signs also have a yellow background with a black inscription indicating a destination on the airport. These signs always have an arrow showing the direction of the taxiing route to that destination. **Figure 12.11(1)** is an example of a typical destination sign. When the arrow on the destination sign indicates a turn, the sign is located prior to the intersection.

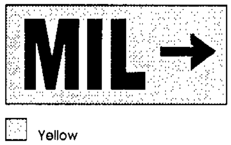


Figure 12.11(1).—Destination Sign for Military Area

12.11.2 Destinations commonly shown on these types of signs include runways, aprons, terminals, military areas, civil aviation areas, cargo areas, international areas, and fixed base operators. An abbreviation may be used as the inscription on the sign for some of these destinations.

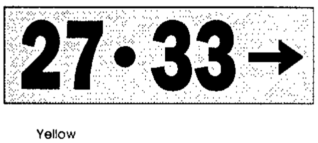


Figure 12.11(2).—Destination Sign for Common Taxiing Route to Two Runways

12.11.3 When the inscription for two or more destinations having a common taxiing route are placed on a sign, the destinations are separated by a "dot" (•) and one arrow would be used as shown in **Figure 12.11(2).** When the inscription on a sign contains two or more destinations having different taxiing routes, each destination will be accompanied by an arrow and will be separated from the other destinations on the sign with a vertical black message divider as shown in **Figure 12.11(3).**

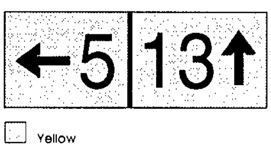


Figure 12.11(3).—Destination Sign for Different Taxiing Routes to Two Runways

12.12 Information Signs

12.12.1 Information signs have a yellow background with a black inscription. They are used to provide the pilot with information on such things as areas that cannot be seen from the control tower, applicable radio frequencies, and noise abatement procedures. The airport operator determines the need, size, and location for these signs.

12.13 Runway Distance Remaining Signs

12.13.1 Runway distance remaining signs have a black background with a white numeral inscription and may be installed along one or both side(s) of the runway. The number on the signs indicates the distance (in thousands of feet) of landing runway remaining. The last sign, i.e., the sign with the numeral "1," will be located at least 950 feet from the runway end. **Figure 12.13(1)** shows an example of a runway distance remaining sign.

Figure 12.13(1).—Runway Distance Remaining Sign Indicating 3,000 Feet of Runway Remaining

12.14 Aircraft Arresting Devices

12.14.1 Certain airports are equipped with a means of rapidly stopping military aircraft on a runway. This equipment, normally referred to as EMERGENCY ARRESTING GEAR, generally consists of pendant cables supported over the runway surface by rubber "donuts" Although most devices are located in the overrun areas, a few of these arresting systems have cables stretched over the operational areas near the ends of a runway.

12.14.2 Arresting cables which cross over a runway require special markings on the runway to identify the cable location. These markings consist of ten foot diameter solid circles painted "identification yellow", 30 feet on center, perpendicular to the runway centerline across the entire runway width. Details are contained in FAA Advisory Circular-150/5220-9, Aircraft Arresting Systems for Joint/Civil Military Airports.

Note. — Aircraft operations on the runways are NOT restricted by such installations.

APPENDIX ONE

Legend for fire fighting and rescue equipment requirements for aerodromes certificated for air carriers under FAR Part 139.

FAR-PART 139 CERTIFICATED AIRPORTS

INDICES AND FIRE FIGHTING AND RESCUE EQUIPMENT REQUIREMENTS

Airport Index	*Required No. Vehicles*	*Aircraft Length*	*Scheduled Departures*	*Agent+Water for Foam*
A	1	≦90’	≧1	500#DC or 450#DC+50 gal H_2
AA	1	>90’,≦126’	<5	300#DC+500 gal H_2
B	2	>90’,≦126’, >126’,≦160’	≧5,<5	Index A+1500 gal H_2
C	3	>126’,≦160’, >160’,≦200’	≧5,<5	Index AG6+3000 gal H_2
D	3	>160’,≦200’,>200’	≧5,<5	Index A+4000 gal H_2
E	3	>200’	≧5	Index A+6000 gal H_2

>Greater Than;<Less Than;≧Equal or Greater Than;≦Equal or Less Than; H_2— Water; DC — Dry Chemical.

Note: If AFFF (Aqueous Film Forming Foam) is used in lieu of Protein Foam, the water quantities listed for Indices AA thru E can be reduced 33 ⅓%. See FAR Part 139.49 for full details. The listing of CFR index does not necessarily assure coverage for non-air carrier operations or at other than prescribed times for air carrier.

Vehicle and capacity requirements for airports holding limited operating certificates are determined on a case by case basis.

1 CITY, STATE/AERODROME: **DETROIT, MI/ DETROIT METRO. WAYNE COUNTY AIRPORT**

2 REFERENCE POINT:
Lat. 42°12'54.9''N, Long. 83°20'55.1''W.

3 DISTANCE AND DIRECTION FROM CITY:
15 NM S.

4 ELEVATION:
639 ft (195 M)

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
28°C (July).

6 MAGNETIC VARIATION:
06°W

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Wayne County

10 POSTAL ADDRESS:
Leroy C. Smith Terminal-Mezzanine
Metropolitan Airport
Detroit, Michigan 48242

11 TELEGRAPHIC ADDRESSES:
AFTN: KDTW

12 TELEPHONE NUMBERS:
313-942-3550

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid room at airport.
Hospitals in adjacent area and city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, limousines and rental cars.

17 CARGO HANDLING FACILITIES:
Adequate for all anticipated requirements.

18 FUEL GRADES:
100LL, Jet A, A1+.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen and replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
None.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes—up to DC-8.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index E.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Ldg fee. Brightly lgtd parking lot 2.6 NM SW of ap. Birds on and in vcy of ap.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
Yes.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	1	1	7	14	21	26	29	28	24	17	9	3
Min (B)	-7	-6	-2	3	9	15	17	17	13	7	1	-4

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	69	66	59	53	50	52	51	53	53	54	63	58
(B)	79	79	77	74	71	74	75	81	82	81	79	66

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **DETROIT, MI/ DETROIT METRO. WAYNE COUNTY AIRPORT**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
03L 21R	28°41' 208°41'	3658 x 60	3658 3658	3658 3658	3658 3658	3658 3658	638 636	- -	- -	70/R/C/X/T	CONC-Grooved	- -
03C 21C	28°41' 208°41'	2591 x 60	2591 2591	2591 2591	2591 2591	2591 2591	636 631	- -	- -	70/R/C/X/T	ASPH-CONC-Grooved	- -
03R 21L	28°41' 208°41'	3048 x 45	3048 3048	3048 3048	3048 3048	3048 3048	633 632	- -	- -	70/R/C/X/T	CONC-Grooved	- -
09L 27R	88°41' 268°41'	2652 x 60	2652 2652	2652 2652	2652 2652	2652 2652	638 635	- -	- -	70/R/C/X/T	ASPH-CONC-Grooved	- -
09R 27L	88°42' 268°42'	2591 x 45	2591 2591	2591 2591	2591 2591	2591 2591	636 629	- -	- -	70/R/C/X/T	CONC-Grooved	- -

Landing Area Remarks: High speed exits Rwys 03L, 21R, 03R, and 21L.

31 MOVEMENT AREAS

APRONS: Concrete.
TAXIWAYS: 75 ft. (23) width. Concrete.
HELICOPTER ALIGHTING AREA: Yes-northeast of control tower.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Lighted signs at main intersections. Blue taxiway lights all taxiways.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator - LGTD.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwy 03L—ALSF2; Rwy 03R—ALSF2; Rwys 21L, 21R, 27R—MALSR; Rwy 21C—RAIL.
REIL: Rwys 03C, 09L, 21C.
RVR: Rwys 03L, 21R, 03R, 21L.
VASI: Rwys 03C, 09L, 21C.
THRESHOLD LIGHTS: All thresholds—green.
RUNWAY LIGHTS: All rwys—white high intensity. Centerline—Rwys 03L/21R, 03C/21C, 03R/21L. Touchdown zone—Rwys 03L, 03R. ALSF2 functions under CAT II only; SSALR other times.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
Yes.

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS:
Runway centerline and sidestripes, numerals, thresholds, touchdown, and fixed-distance markings. Taxiways centerline and taxiway hold markings.

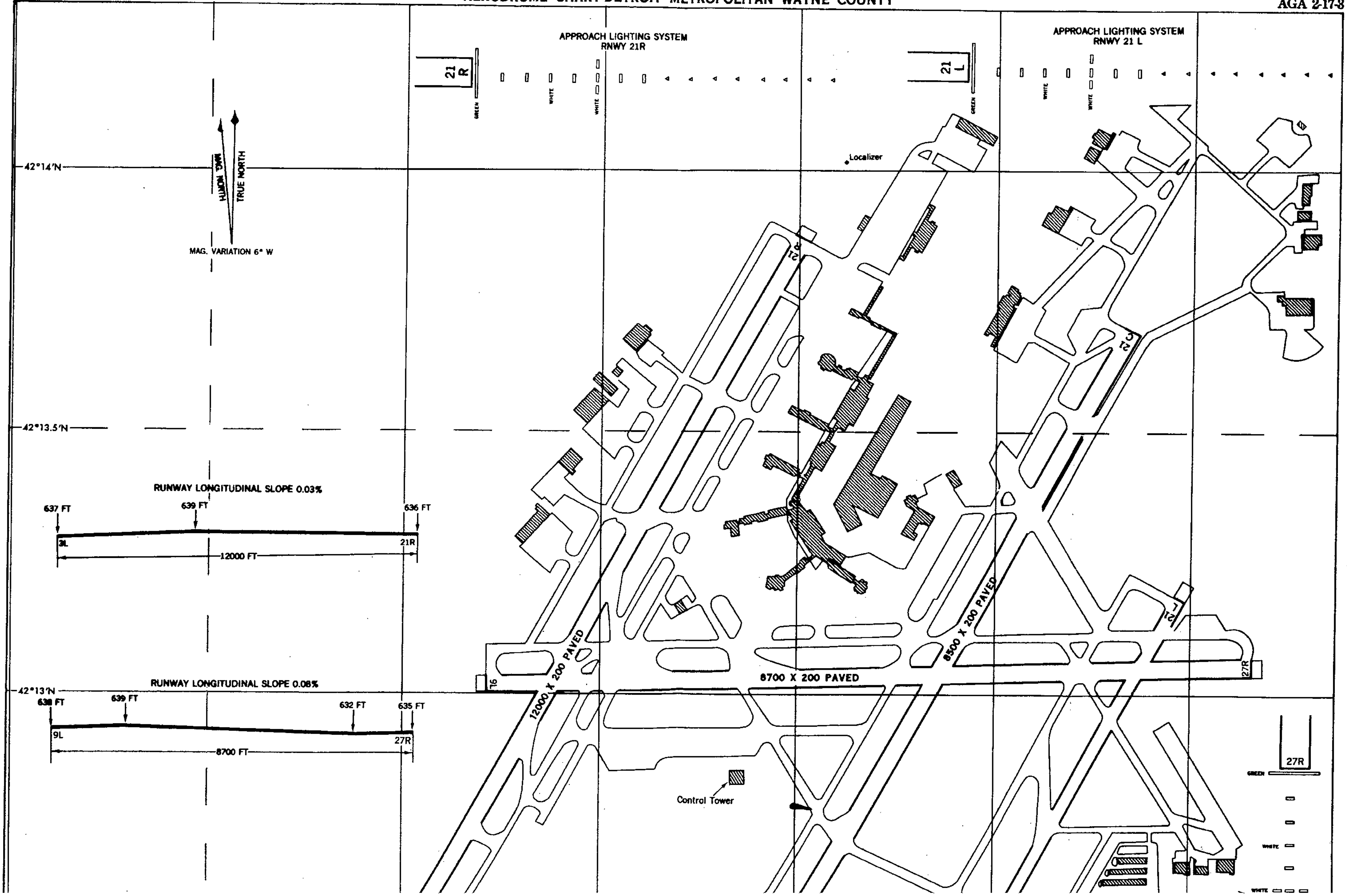
39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

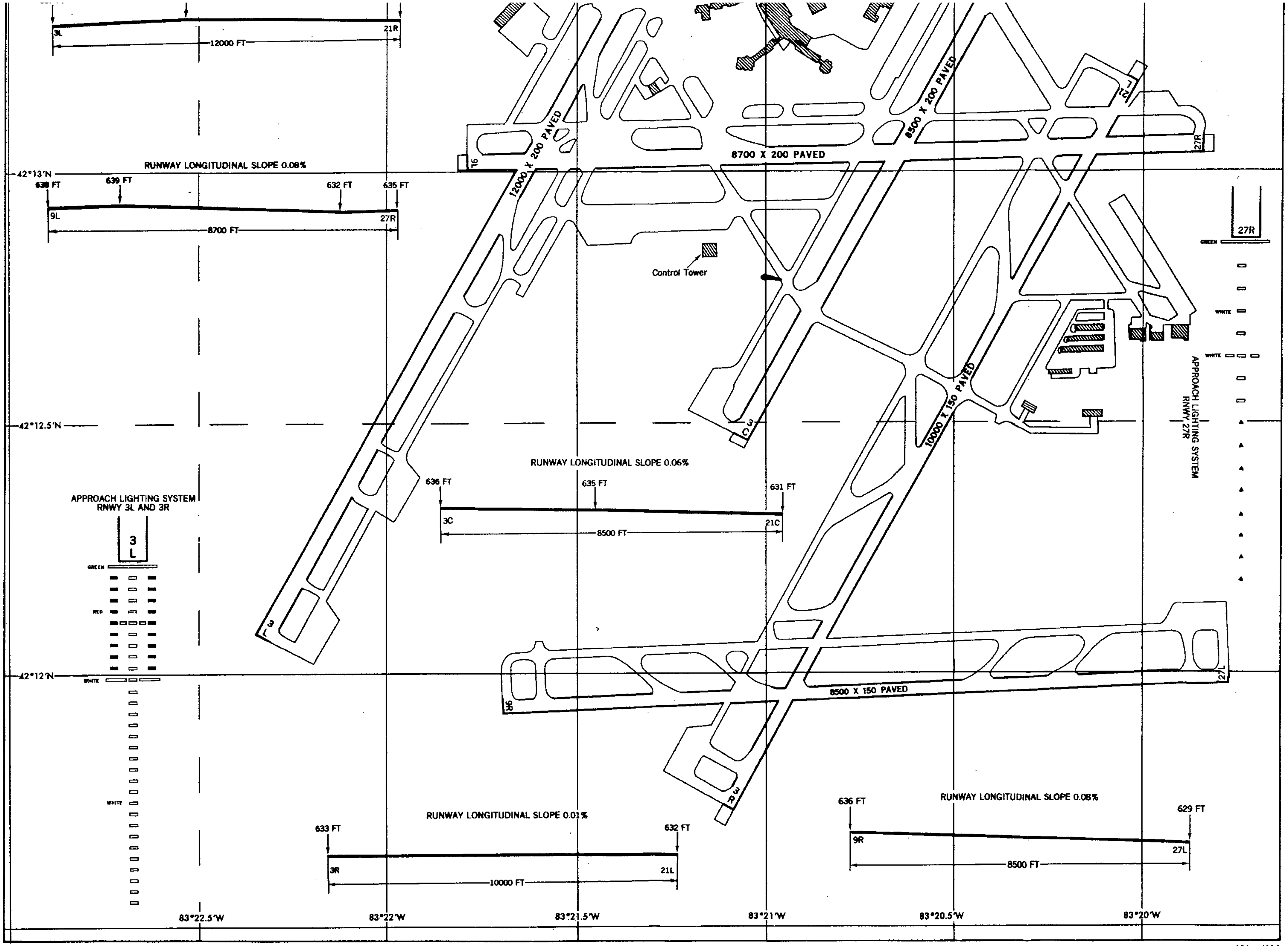
Runway Identification	03L	21R	03R	21L	09L	27R	03C	21C	09R	27L
Controlling Obstruction		RR			Trees		Tree			ANT
Obstn Clnc Slope	50:1	33:1	50:1	50:1	44:1	50:1	36:1	50:1	50:1	36:1
Dist from Runway End		1,058 (322)			4,765 (1452)		3,339 (1018)			4,009 (1222)

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, B-707

AERODROME CHART-DETROIT METROPOLITAN WAYNE COUNTY





3L
21R
12000 FT
RUNWAY LONGITUDINAL SLOPE 0.08%
638 FT
639 FT
632 FT
635 FT
9L
27R
8700 FT
42°13'N
42°12.5'N
42°12'N
12000 X 200 PAVED
8700 X 200 PAVED
8500 X 200 PAVED
10000 X 150 PAVED
8500 X 150 PAVED
Control Tower
APPROACH LIGHTING SYSTEM RNWY 3L AND 3R
GREEN
RED
WHITE
RUNWAY LONGITUDINAL SLOPE 0.06%
636 FT
635 FT
631 FT
3C
21C
8500 FT
APPROACH LIGHTING SYSTEM RNWY 27R
RUNWAY LONGITUDINAL SLOPE 0.01%
633 FT
632 FT
3R
21L
10000 FT
RUNWAY LONGITUDINAL SLOPE 0.08%
636 FT
629 FT
9R
27L
8500 FT
83°22.5'W
83°22'W
83°21.5'W
83°21'W
83°20.5'W
83°20'W

1 CITY, STATE/AERODROME: **EVERETT, WA/SNOHOMISH COUNTY (PAINE FIELD)** [ALTERNATE]

2 REFERENCE POINT:
Lat. 47°54'27.5''N, Long. 122°16'54''W.

3 DISTANCE AND DIRECTION FROM CITY:
6 NM SW.

4 ELEVATION:
606 FT (185 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
17°C. (July).

6 MAGNETIC VARIATION:
21°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
Mon-Fri 0700-2100; Sat-Sun 0800-2000.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Snohomish County.

10 POSTAL ADDRESS:
Airport Manager
3220 100th Street, SW
Everett, Washington 98204

11 TELEGRAPHIC ADDRESSES:
AFTN: KPAE

12 TELEPHONE NUMBERS:
206-353-2110

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
None.

18 FUEL GRADES:
80, 100, Jet A.

19 OIL GRADES:
Limited piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen.

21 REFUELING FACILITIES AND LIMITATIONS:
Fuel after hours 206-355-6600.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index A, U.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Arpt clsd ACR opns with more than 30 PSGR seats 2100-0700 excp with PPR. Fee for acft over 30,000 LB (13 605). When ATCT clsd, Rwy 34L left tfc for acft 12,500 lbs GWT, and Military helicopter opns unable to communicate on VHF. Noise sensitive arpt. Acft ovr 250 HP should request Rwy 16R/34L. Birds in vcnty of arpt.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	6	8	9	13	16	19	22	21	19	14	9	7
Min (B)	0	2	2	4	7	9	11	12	10	7	4	2

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	78	76	68	64	64	67	62	65	66	73	77	82
(B)	87	88	86	85	84	85	84	88	90	90	88	89

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **EVERETT, WA/SNOHOMISH COUNTY (PAINE FIELD)** [ALTERNATE]

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designa-tion	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
11 29	134°08' 314°08'	1376 x 23	1376 1376	1376 1376	1376 1376	1132 1376	572 600	- -	- -	33/F/B/X/T	ASPH	- -
16L 34R	179°34' 359°34'	914 x 23	914 914	914 914	914 914	914 914	597 596	- -	- -	-	ASPH- Grooved	- -
16R 34L	179°08' 359°08'	2746 x 45	2746 2746	2746 2746	2746 2746	2746 2746	554 573	- -	- -	71/F/B/X/T	ASPH- CONC	- -

Landing Area Remarks: Rwys 11/29, 16L/34R clsd when ATCT clsd and, clsd to acft over 250 horsepower unless directed by ATC. Rwy 11 thr dsplcd 799 FT (244).

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: ASPH. HELICOPTER ALIGHTING AREA: Yes.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: B TWY LGTS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: None.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 16R—MALSR, RWY 34L—ODALS, activate on 121.3 when TWR CLSD.
RVR: 16R.
VASI: RWYS 34L, 11, 29.
REIL: RWYS 16L, 34R.
THRESHOLD LIGHTS: None.
RUNWAY LIGHTS: RWYS 11/29, 16L/34R—medium INTST. RWY 16R/34L—high INTST, CTAF when TWR CLSD.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: No.

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS: RWY CL and sidestripes, numerals, THR, touchdown, and TWY hold markings. Rwy 34L side stripes at 150 feet, full 200 feet usable, rwy lgts at 200 feet.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	11	29	16R	34L	16L	34R
Controlling Obstruction	Trees	Trees		Trees		Pole
Obstn Clnc Slope	0:1	23:1	50:1	30:1	22:1	19:1
Dist from Runway End	200 (61)	1,300 (396)		4,000 (1219)		690 (210)

Obstruction Remarks: APCH ratio to displaced THR RWY 11—28:1.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-707

1 CITY, STATE/AERODROME: **FRESNO, CA/FRESNO AIR TERMINAL** [ALTERNATE]

2 REFERENCE POINT:
Lat. 36°46'34.3''N, Long. 119°43'05.3''W.

3 DISTANCE AND DIRECTION FROM CITY:
5 NM NE.

4 ELEVATION:
333 FT (146 M)

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
38°C. (July).

6 MAGNETIC VARIATION:
15°54'E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of Fresno

10 POSTAL ADDRESS:
2401 N. Ashley Way
Fresno, CA 93727

11 TELEGRAPHIC ADDRESSES:
AFTN: KFAT

12 TELEPHONE NUMBERS:
209-251-6051, 498-4700

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
Ambulances on call from adjacent area.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis and rental cars.

17 CARGO HANDLING FACILITIES:
Adequate for all anticipated requirements.

18 FUEL GRADES:
A, 100.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen and high and low pressure replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes—up to Twin-Beech.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major and minor airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index C.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
RITE TFC RWYS 11R, 29R. TFC pattern ALT—airplane single-engine land (ASEL): 1,300 FT (396) MSL; airplane multi-engine land (AMEL): 1,800 FT (549) MSL; turbojets: 2,300 FT (701) MSL; HEL: 800 FT (244) MSL. Fee for ACFT over 12,500 LB (5 670) gross WT. Birds vcnty arpt.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	12	16	20	24	29	33	38	36	33	26	19	13
Min (B)	2	5	6	9	12	15	18	16	14	9	5	3

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)	69	56	43	35	28	23	21	22	27	33	51	68
(B)	94	92	88	84	77	68	62	69	74	77	85	91

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **FRESNO, CA/FRESNO AIR TERMINAL** [ALTERNATE]

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
11L 29R	125°21' 305°21'	2811 x 45	2811 2811	2811 2811	3070 3116	2811 2811	331 330	259 305	- -	21/R/A/Y/T	ASPH	CONC CONC
11R 29L	125°21' 305°21'	2196 x 30	2196 2196	2196 2196	2256 2565	1755 2195	329 328	60 370	- -	14/F/A/Y/T	ASPH	ASPH ASPH

Landing Area Remarks: High speed exits RWYS 11L, 29R. RWY 11R thr displaced 1,448 FT (441). PSBL Wake Trubulence or Wind Shear, ARR to Rwy 29L or DEP from Rwy 11R.

31 MOVEMENT AREAS

APRONS: ASPH-CONC. TAXIWAYS: 50 FT (15) and 75 FT (23) widths. CONC. HELICOPTER ALIGHTING AREA: Yes.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: B TWY LGTS primary TWYS.

33 VISUAL AIDS TO LOCATION: Rotating BCN—ALTN W and G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: LGTD tee; LGTD cone; segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 29R—SSALR.
RVR: RWYS 29R, 11L.
RVV: RWY 11L.
REIL: RWYS 11L, 11R.
VASI: RWYS 11L, 29R.
THRESHOLD LIGHTS: All THRS—G.
RUNWAY LIGHTS: RWY 11L/29R—W high INTST. RWY 11R/29L—W medium INTST. CL LGT—RWYS 11L/29R. TDZ—RWY 29R.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: No.

37 OBSTRUCTION MARKING AND LIGHTING: R obstruction LGTS—day and NGT.

38 MARKING AIDS: RWY CL numerals, THR, touchdown, and sidestripe markings. TWY CL and TWY hold markings. MIL type RWY distance remaining signs S side of RWY 11R/29L unLGTD. LGTD RWY distance remaining signs both sides of RWY 11L/29R.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	11L	29R	11R	29L
Controlling Obstruction	Pole	Road		
Obstn Clnc Slope	37:1	34:1	50:1	20:1
Dist from Runway End	1,360 (415)	750 (340)		

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: Yes, B-727-200

1 CITY, STATE/AERODROME: **KANSAS CITY, MO/KANSAS CITY INTERNATIONAL**

2 REFERENCE POINT:
Lat. 39°17'57.2''N, Long. 94°43'04.7''W.

3 DISTANCE AND DIRECTION FROM CITY:
15 NM NW.

4 ELEVATION:
1,026 ft (313 M)

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
31°C. (July).

6 MAGNETIC VARIATION:
05°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of Kansas City.

10 POSTAL ADDRESS:
Kansas City International Airport
1 International Square
PO Box 20047
Kansas City, MO 64195

11 TELEGRAPHIC ADDRESSES:
AFTN: KMCI

12 TELEPHONE NUMBERS:
816-243-5259

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Taxis, busses, rental cars.

17 CARGO HANDLING FACILITIES:
Yes.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
None.

20 OXYGEN AND RELATED SERVICING:
No.

21 REFUELING FACILITIES AND LIMITATIONS:
None.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

24 CRASH EQUIPMENT:
ARFF Index C.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Rigt tfc Rwys 19R, 27. Ldg fee. Birds in vcnty of arpt. Military acft may be charged ramp/parking fees and parking overnight. Prior approval to park at airline gate areas.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	2	6	10	18	24	28	31	30	26	21	12	5
Min (B)	-7	-4	0	7	13	18	21	20	15	9	1	-4
Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures												
(A)	1020	1019	1015	1013	1012	1012	1013	1014	1015	1016	1018	1019
(B)	1021	1019	1016	1014	1014	1013	1015	1015	1016	1017	1018	1120
Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures												
(A)	64	61	61	55	55	55	47	54	62	60	64	67
(B)	73	74	79	76	82	82	79	84	86	81	79	77

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **KANSAS CITY, MO/KANSAS CITY INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
01L 19R	12°56' 192°56'	3292 x 45	3292 3292	3292 3292	3292 3292	3292 3292	1011 977	- -	- -	62/F/B/W/T	ASPH- Grooved	- -
01R 19L	12°56' 192°56'	2893 x 45	2893 2893	2893 2893	2893 2893	2893 2893	977 1017	- -	- -	75/R/B/W/T	CONC- Grooved	- -
09 27	96°07' 276°07'	2896 x 45	2896 2896	2896 2896	2896 2896	2896 2896	1014 1026	- -	- -	30/F/B/W/T	ASPH- Grooved	- -

Landing Area Remarks: High speed twys A4, A6, A8, C2, C6, and C7 grooved within 10 feet (3) of both edges. When using high speed exits C3, C5, and C6, continue until first parallel taxiway, then use extreme caution when turning in excess of 90 degrees. High speed exits Rwys 01L, 19R, 09, 27.

31 MOVEMENT AREAS

APRONS: Asphalt.
TAXIWAYS: Asphalt.
HELICOPTER ALIGHTING AREA: None.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Blue taxiway lights all taxiways.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator—lgtd, and Windshear Alert System on arpt.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwy 19R—ALSF2. Rwys 01L, 09, 27—MALSR.
RVR: Rwy 01L, 09, 19R, 27.
REILS: NONE.
VASI: Rwy 27.
THRESHOLD LIGHTS:
RUNWAY LIGHTS: High intensity all Rwys. Centerline—Rwys 01L/19R, 09/27. Touchdown zones—Rwys 01L, 19R, 09.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
Yes.

37 OBSTRUCTION MARKING AND LIGHTING:
Red obstruction lights—day and night.

38 MARKING AIDS:
Runway centerline, sidestripes, numerals, threshold, and touchdown markings. Taxiway and taxiway hold markings.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	01	19	09	27	01R	19L
Controlling Obstruction						
Obstn Clnc Slope	50:1	50:1	50:1	50:1	50:1	50:1
Dist from Runway End						

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, B-707

1 CITY, STATE/AERODROME: **NEW ORLEANS, LA/NEW ORLEANS INTERNATIONAL AIRPORT (MOISANT FIELD)**

2 REFERENCE POINT:
Lat. 29°59'36.1''N, Long. 90°15'28.6''W.

3 DISTANCE AND DIRECTION FROM CITY:
10 NM W.

4 ELEVATION:
6 ft (1 M)

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
32°C. (August).

6 MAGNETIC VARIATION:
2°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
City of New Orleans

10 POSTAL ADDRESS:
New Orleans International Airport
P.O. Box 20007
New Orleans, Louisiana 70141

11 TELEGRAPHIC ADDRESSES:
AFTN: KMSY

12 TELEPHONE NUMBERS:
504-464-0831

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
Yes.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
No.

21 REFUELING FACILITIES AND LIMITATIONS:
Yes. No limitations.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
No.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
None.

24 CRASH EQUIPMENT:
ARFF Index D.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Flocks of birds on and in vcy of ap. Locked wheel and 180° turns prohibited on asphalt sfc for aircraft 12,500 lbs (5 670) and over.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	17	19	22	25	29	32	32	32	31	27	21	18
Min (B)	8	9	11	15	19	22	23	23	22	17	11	9

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **NEW ORLEANS, LA/NEW ORLEANS INTERNATIONAL AIRPORT (MOISANT FIELD)**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
01 19	15°29' 195°29'	2134 x 45	2134 2134	2134 2134	2134 2134	2134 2134	3 -1	- -	- -	94/F/D/X/U	ASPH- Grooved	- -
06 24	60°29' 240°29'	1384 x 45	1384 1384	1384 1384	1384 1384	1384 1300	2 1	- -	- -	94/F/D/X/U	ASPH	- -
10 28	105°28' 285°28'	3073 x 45	3073 3073	3073 3073	3073 3073	3073 2988	6 2	- -	- -	94/F/D/X/U	ASPH- CONC- Grooved	- -

Landing Area Remarks: Rwy 28 thr dsplcd 280 ft (85). Rwy 24 thr dsplcd 276 ft (84). Rwy 06/24 clsd to acft 25,000 lbs (11 340) and over.

31 MOVEMENT AREAS

APRONS: Concrete.
TAXIWAYS: Asphalt 75 ft (23) widths.
HELICOPTER ALIGHTING AREA: Yes.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Blue taxiway lights—taxiways 10-28 and 01-19.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator—lighted.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwy 10—ALSF1. Rwy 19—MALS. Rwy 28—MALSR.
REIL: None.
LDIN: Rwy 01.
RVR: Rwys 10, 28, 01, 19.
VASI: Rwys 19, 28, 24, 10.
THRESHOLD LIGHTS: All thresholds except Rwys 06 and 24—green.
RUNWAY LIGHTS: Rwys 01/19, 10/28, 06/24—white high intensity. Centerline—Rwys 10/28, 01/19. Touchdown zone—Rwy 10.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
Yes.

37 OBSTRUCTION MARKING AND LIGHTING:
Red obstruction lights—day and night.

38 MARKING AIDS:
Runway centerline sidestripes, numerals, and threshold markings. Taxiway centerline and taxiway hold markings.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	10	28	01	19	06	24
Controlling Obstruction		Tree	Road	Road	Pole	Road
Obstn Clnc Slope	50:1	23:1	0:1	0:1	34:1	12:1
Dist from Runway End		1,807 (551)	200 (61)	200 (62)	1,754 (535)	350 (106)

Obstruction Remarks: Apch ratio from displaced thre: Rwy 24, 50:1, Rwy 28, 33:1.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, DC-10

1 CITY, STATE/AERODROME: **NEW YORK, NY/JOHN F. KENNEDY INTERNATIONAL**

2 REFERENCE POINT:
Lat 40°38'23.1''N, Long. 73°46'45.3''W.

3 DISTANCE AND DIRECTION FROM CITY:
13 NM SE of Manhattan.

4 ELEVATION:
13 FT (4 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
29°C. (July).

6 MAGNETIC VARIATION:
13°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Port Authority of New York & New Jersey

10 POSTAL ADDRESS:
Dept. Marine and Aviation
New York, NY 10048

11 TELEGRAPHIC ADDRESSES:
AFTN: KJFK

12 TELEPHONE NUMBERS:
718-244-3501

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid and ambulance at airport.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, taxis, limousines, rental cars and helicopters.

17 CARGO HANDLING FACILITIES:
Adequate for all anticipated requirements.

18 FUEL GRADES:
100LL, Jet A.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High pressure oxygen and replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
Prior arrangements for fuel required for non-based charter and commercial aircraft, 718-244-4411.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index E.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Flocks of birds on and in VCY of AP. RITE TFC RWYS 13L, 13R. LDG fee. INTL ramp ARR must obtain a gate assignment from INTL Ramp Control BFR entering ramp area. Ramp control FREQ is 130.775. High Density Traffic Airport (HDTA)—prior reservation required. Prior APV required for MILitary fighters and turboprops.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	4	4	9	15	21	26	29	28	24	18	12	5
Min (B)	-3	-3	0	5	11	17	20	19	16	10	5	-1

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **NEW YORK, NY/JOHN F. KENNEDY INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
04L 22R	30°45' 210°45'	3460 x 45	3460 3460	3460 3460	3460 3460	3460 2539	12 13	- -	- -	94/F/A/W/T	ASPH- CONC- Grooved	- -
04R 22L	30°46' 210°46'	2560 x 45	2560 2560	2560 2560	2560 2560	2560 2560	13 12	- -	- -	94/F/A/W/T	ASPH- Grooved	- -
13L 31R	120°45' 300°45'	3048 x 45	2743 3048	2743 3048	2743 3048	2746 2736	13 13	- -	- -	94/F/A/W/T	ASPH- Grooved	- -
13R 31L	120°44' 300°44'	4442 x 45	4442 4442	4442 4442	4442 4442	3648 3429	13 13	- -	- -	94/F/A/W/T	ASPH- CONC- Grooved	- -

Landing Area Remarks: RWY 13R THR displaced 2,606 FT (794). RWY 31L THR displaced 3,324 FT (1 013). RWY 22R THR displaced 3,021 FT (921). RWY 13L THR displaced 990 FT (302). RWY 31R THR displaced 1,024 FT (312). Pilots change to upper antenna for RWY 13 DEP.

31 MOVEMENT AREAS

APRONS: ASPH. TAXIWAYS: 75 FT (23) widths. ASPH. HELICOPTER ALIGHTING AREA: Yes—3,500 FT (1 067) west-north-west of TWR.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM: LGTD SIGNS AT ALL INTS. B TWY LGTS AT RWY EXITS. G CL LGTS.

33 VISUAL AIDS TO LOCATION: ROTATING BCN—ALTN W AND G.

34 INDICATORS AND GROUND SIGNALLING DEVICES: LGTD WIND INDICATOR.

35 LIGHTING AIDS

APPROACH LIGHTS: RWY 13L—ALSF1. RWYS 31R, 22L—MALSR. RWY 04R—ALSF2.
REIL: RWYS 04L.
RVR: RWYS 31L, 31R, 04L, 04R, 22L, 22R, 13R, 13L.
VASI: RWYS 13R, 13L.
THRESHOLD LIGHTS: All THRS—G.
RUNWAY LIGHTS: RWYS 04R/22L, 04L/22R, 13L/31R, 13R/31L—W high INTST. Lead in LGTS—RWY 13L. CL LGTS—RWYS 04R/22L, 04L/22R, 13L/31R, 13R/31L. TDZ—RWYS 04R, 22L, 13L.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY: YES.

37 OBSTRUCTION MARKING AND LIGHTING: R OBSTRUCTION LGTS—DAY AND NGT.

38 MARKING AIDS:
RWY CL and sidestripes, numerals, THR, and touchdown markings. TWY CL and TWY hold markings.

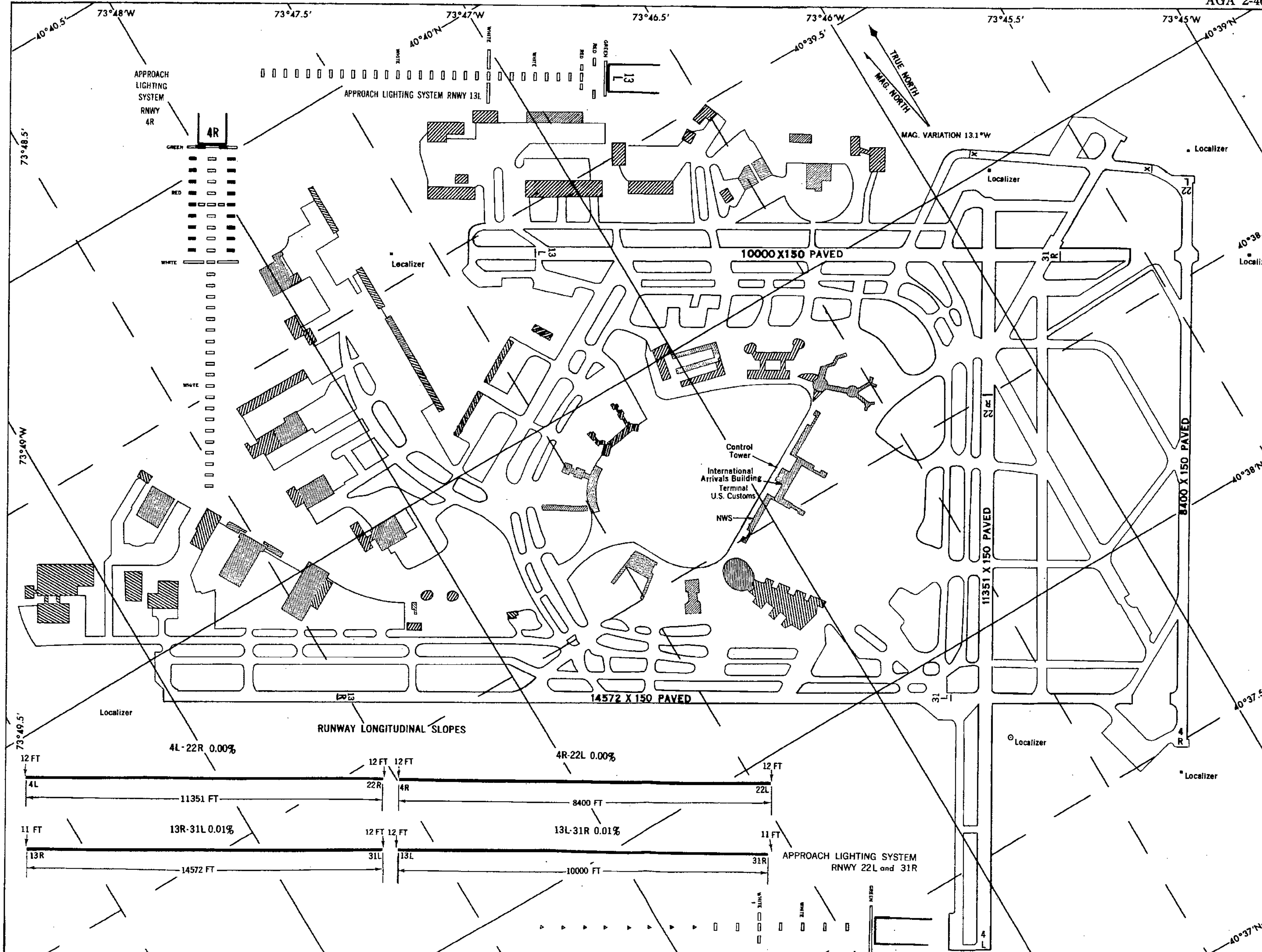
39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	13R	31L	13L	31R	04R	22L	04L	22R	
Controlling Obstruction		Pole	Road	Ant	Fence			Fence	
Obstn Clnc Slope	50:1	4:1	0:1	29:1	37:1	50:1	50:1	8:1	
Dist from Runway End		350 (107)	200 (61)	1,025 (312)	500 (152)			280 (85)	1,400

Obstruction Remarks: APCH ratios to displaced THRS: RWYS 13L, 13R, 31L, 31R, and 22R, 50:1.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY: YES, B-747

AERODROME CHART - JOHN F. KENNEDY INTERNATIONAL



1 CITY, STATE/AERODROME: **PALMDALE, CA/PALMDALE PRODN FLT/TEST INSTLN AF PLANT 42** [ALTERNATE]

2 REFERENCE POINT:
Lat. 34°37'48.5''N, Long. 118°05'04.4''W.

3 DISTANCE AND DIRECTION FROM CITY:
3 NM NE.

4 ELEVATION:
2,543 ft (775 M)

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
28°C. (July).

6 MAGNETIC VARIATION:
14°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
0600-0000. Permission from Commanding Officer required for landing.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
United States Air Force

10 POSTAL ADDRESS:
2503 East Avenue ''P''
Palmdale, CA 93550

11 TELEGRAPHIC ADDRESSES:
AFTN: KPMD

12 TELEPHONE NUMBERS:
805-272-6708

13 OVERNIGHT ACCOMMODATION:
None.

14 RESTAURANT ACCOMMODATION:
None.

15 MEDICAL FACILITIES:
Nurse, first-aid room, ambulance and helicopter at airport during working hours. Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Taxis.

17 CARGO HANDLING FACILITIES:
None.

18 FUEL GRADES:
None.

19 OIL GRADES:
None.

20 OXYGEN AND RELATED SERVICING:
None.

21 REFUELING FACILITIES AND LIMITATIONS:
None.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
None.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
None.

24 CRASH EQUIPMENT:
ARFF Index B.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Right tfc Rwys 04, 25. Ap lights available on request through twr. Ap clsd to all tfc when twr clsd. Ldg fee.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)												
Min (B)												

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)												
(B)												

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)												
(B)												

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **PALMDALE, CA/PALMDALE PRODN FLT/TEST INSTLN AF PLANT 42** [ALTERNATE]

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
04 22	51°48' 231°48'	3658 x 45	3658 3658	3658 3658	3658 3658	3658 3658	2543 2491	- -	- -	-	ASPH	- -
07 25	86°11' 266°11'	3659 x 45	3659 3659	3659 3659	3659 3659	3659 3049	2540 2499	- -	- -	-	ASPH-CONC	- -

Landing Area Remarks: Rwy 25 dsplcd THR 2,000 FT. (610).

31 MOVEMENT AREAS

APRONS: Asphalt.
TAXIWAYS: Asphalt 75 ft (23) and 150 ft (46) width.
HELICOPTER ALIGHTING AREA: None.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Lighted signs at all intersections. Blue taxiway lights all taxiways.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Lighted cone. Segmented circle.

35 LIGHTING AIDS

APPROACH LIGHTS: None.
RVR: None.
REIL: None.
VASI: None.
THRESHOLD LIGHTS: All threshold—green.
RUNWAY LIGHTS: Rwy 07/25—white high intensity. Rwy 04/22—unlighted.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
No.

37 OBSTRUCTION MARKING AND LIGHTING:
Red obstruction lights—day and night.

38 MARKING AIDS:
Runway centerline, sidestripes, numerals, and threshold markings. Taxiway centerline markings.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	04	22	07	25
Controlling Obstruction	Hill			
Obstn Clnc Slope	35:1	50:1	50:1	50:1
Dist from Runway End	23,000 (7 010)			

Obstruction Remarks: None.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, B-747

1 CITY, STATE/AERODROME: **PORTLAND, OR/PORTLAND INTERNATIONAL** [ALTERNATE]

2 REFERENCE POINT:
Lat. 45°35'19.3''N, Long. 122°35'51''W.

3 DISTANCE AND DIRECTION FROM CITY:
4 NM NE.

4 ELEVATION:
27 ft (8 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
25°C. (July).

6 MAGNETIC VARIATION:
19°E.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Port of Portland

10 POSTAL ADDRESS:
7000 NE Airport Way
Portland, OR 97218

11 TELEGRAPHIC ADDRESSES:
AFTN: KPDX

12 TELEPHONE NUMBERS:
503-335-1112

13 OVERNIGHT ACCOMMODATION:
Unlimited.

14 RESTAURANT ACCOMMODATION:
Unlimited.

15 MEDICAL FACILITIES:
First-aid room at airport.
Physician on call.
Hospitals in city.

16 TRANSPORTATION AVAILABLE:
Busses, limousines and rental cars.

17 CARGO HANDLING FACILITIES:
Yes.

18 FUEL GRADES:
100, Jet A, B.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
High and low pressure oxygen and replacement bottles.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index E.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Right tfc Rwys 10R and 28R. Clsd to glider acft. Birds in vcy. Noise abatement proc in effect.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	6	9	13	17	20	23	26	26	23	17	11	8
Min (B)	0	1	3	5	8	11	13	13	11	8	4	2

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **PORTLAND, OR/PORTLAND INTERNATIONAL** [ALTERNATE]

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designa-tion	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
02 20	45°01' 225°01'	2134 x 45	2134 2134	2134 2134	2134 2134	2134 1985	18 23	- -	- -	34/F/A/X/T	ASPH	- -
10L 28R	119°01' 299°01'	2440 x 45	2440 2440	2440 2440	2440 2440	2440 2440	25 25	- -	- -	63/F/A/X/T	ASPH-Grooved	- -
10R 28L	119°00' 299°00'	3353 x 45	3353 3353	3353 3353	3653 3353	3353 3353	19 19	- -	- -	63/F/A/X/T	ASPH-Grooved	- -

Landing Area Remarks: Rwy 20 thr displaced 489 ft (149). 180 deg turns by acft heavier than 12,500 lbs (5 670) prohibited on all rwys and twys. Rwy 28R 19 ft (6) levee aprx parallel to rwy cl extd at 200 ft (61) from thr; dike aprx 480 ft 9146) 480 ft (146) NE fr rwy cl.

31 MOVEMENT AREAS

APRONS: Asphaltic concrete and concrete.
TAXIWAYS: 100 ft (30) width. Asphaltic concrete.
HELICOPTER ALIGHTING AREA: None.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Blue taxiway lights all taxiways.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator—lighted.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwy 28R—ALSF1. Rwy 10L—MALS. Rwy 10R—ALSF2.
RVR: Rwys 28R, 10R, 28L.
RVV: None.
REIL: Rwy 20.
VASI: Rwys 10L, 20, 28L.
THRESHOLD LIGHTS: All thresholds—green.
RUNWAY LIGHTS: Rwys 10R/28L, 10L/28R—white high intensity. Rwy 02/20—white medium intensity. Centerline—Rwy 10R/28L. Touchdown zone—Rwy 10R.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
No.

37 OBSTRUCTION MARKING AND LIGHTING:

38 MARKING AIDS:
Runway centerline, sidestripes, numerals, thresholds, and touchdown markings. Taxiway centerline and taxi-hold.

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	10R	28L	10L	28R	02	20
Controlling Obstruction				Road	Tree	Road
Obstn Clnc Slope	50:1	50:1	50:1	0:1	20:1	14:1
Dist from Runway End				200 (61)	1700 (487)	475 (145)

Obstruction Remarks: Rwy 20 displaced thr provides 50:1 over road on levee and 24:1 over trees at 8,640 ft (2 603).

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
No

1 CITY, STATE/AERODROME: **SAN JUAN, PR/LUIS MUNOZ MARIN INTERNATIONAL**

2 REFERENCE POINT:
Lat. 18°26'21.9''N, Long. 66°00'06.6''W.

3 DISTANCE AND DIRECTION FROM CITY:
3 NM SE.

4 ELEVATION:
10 ft (3 M).

5 AERODROME REFERENCE TEMPERATURE (CENTIGRADE):
29°C. (August).

6 MAGNETIC VARIATION:
11°W.

7 TRANSITION ALTITUDE:

8 OPERATIONAL HOURS:
24 hours.

9 AERODROME OPERATOR OR ADMINISTRATIVE AUTHORITY:
Puerto Rico Ports Authority

10 POSTAL ADDRESS:
GPO Box 2829
San Juan, PR 00903

11 TELEGRAPHIC ADDRESSES:
AFTN: MJSJ

12 TELEPHONE NUMBERS:
809-791-4670

13 OVERNIGHT ACCOMMODATION:
Yes.

14 RESTAURANT ACCOMMODATION:
Yes.

15 MEDICAL FACILITIES:
Yes.

16 TRANSPORTATION AVAILABLE:
Yes.

17 CARGO HANDLING FACILITIES:
Yes.

18 FUEL GRADES:
100, 115, Jet A1+.

19 OIL GRADES:
Piston and turbine grades available.

20 OXYGEN AND RELATED SERVICING:
No.

21 REFUELING FACILITIES AND LIMITATIONS:
No.

22 HANGAR SPACE AVAILABLE FOR TRANSIENT AIRCRAFT:
Yes, prior request 48 hours in advance.

23 REPAIR FACILITIES AVAILABLE FOR TRANSIENT AIRCRAFT:
Major airframe and powerplant.

24 CRASH EQUIPMENT:
ARFF Index D.

25 SEASONAL AVAILABILITY:
All seasons.

26 LOCAL FLYING RESTRICTIONS AND AERODROME REMARKS:
Right tfc Rwys 08 and 10. Ldg fee.

27 PRE-FLIGHT ALTIMETER CHECK POINT(S):
None.

28 METEOROLOGICAL DATA

Mean daily maximum and minimum temperatures (C°)

Temperature	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Max (A)	27	27	27	28	29	29	29	29	30	30	28	27
Min (B)	21	21	21	22	23	24	24	24	24	24	23	22

Monthly mean pressure in (MB) at approximately the time of maximum (A) and minimum (B) temperatures

(A)
(B)

Monthly mean of the relative humidity at approximately the times of maximum (A) and minimum (B) temperatures

(A)
(B)

29 SLOPE (GRADIENT): See diagram.

CONTINUED — **SAN JUAN, PR/LUIS MUNOZ MARIN INTERNATIONAL**

30 PHYSICAL CHARACTERISTICS

Runway			Declared Distances				THR ELEV (ft)	Stopway (m)	Clearway (m)	PCN	Runway Surface	Stopway Surface
Designation	True BRG	Length/Width (m)	TORA (m)	TODA (m)	ASDA (m)	LDA (m)						
a	b	c	d	e	f	g	h	i	k	l	m	n
08 26	66°59' 246°59'	3049 x 60	3049 3049	3049 3049	3049 3049	3049 3049	8 7	- -	- -	61/F/B/X/T	ASPH- Grooved	- -
10 28	90°08' 270°08'	2443 x 45	2443 2443	2443 2443	2443 2443	2443 2443	9 9	- -	- -	61/R/B/W/T	CONC- Grooved	- -

Landing Area Remarks: High speed exits Rwys 08, 10, 26.

31 MOVEMENT AREAS

APRONS: Asphalt.
TAXIWAYS: 50 ft (15) width. Concrete.
HELICOPTER ALIGHTING AREA: Yes.

VISUAL GROUND AREAS

32 TAXIING GUIDANCE SYSTEM:
Blue taxiway lights all taxiways.

33 VISUAL AIDS TO LOCATION:
Rotating beacon—alternating white and green.

34 INDICATORS AND GROUND SIGNALLING DEVICES:
Wind indicator - lgtd.

35 LIGHTING AIDS

APPROACH LIGHTS: Rwys 08, 10—MALSR.
REIL: Rwy 26.
VASI: Rwys 08, 10, 26, 28.
THRESHOLD LIGHTS: Rwy 08/26—green.
RUNWAY LIGHTS: Rwys 08/26 and 10/28—white high intensity.

36 EMERGENCY LIGHTING AND SECONDARY POWER SUPPLY:
None.

37 OBSTRUCTION MARKING AND LIGHTING:
Red obstruction lights—day and night.

38 MARKING AIDS:
Runway centerline, numerals, and threshold marking; taxiway centerline and taxiway hold markings, and runway distance marking. Rwys 08/26 distance markers every 1,000 ft (305).

39 OBSTRUCTION IN APPROACH AND TAKE-OFF AREAS

Runway Identification	08	26	10	28
Controlling Obstruction		Tree		Tree
Obstn Clnc Slope	50:1	29:1	50:1	29:1
Dist from Runway End		3,500 (1 036)		4,000 (1 219)

Obstruction Remarks: Due to obstructions twr unable to provide ATC at Puerto Rico resources ramp.

41 DISABLED AIRCRAFT REMOVAL CAPABILITY:
Yes, B-727

COMMUNICATIONS (COM)

Table of Contents

COMMUNICATIONS, NAVIGATIONAL AIDS

1. INTRODUCTION

1.1 Responsible Authority

The authority responsible for the administration of communications services in the U.S. is the Federal Aviation Administration, Air Traffic Control System Programs.

Postal Address:
Federal Aviation Administration
Air Traffic Control System Programs (ATR-100)
800 Independence Ave., SW
Washington, D.C. 20591
*AFTN Address:*KDCAYAYX
Commercial Telegraphic Address:
ACIVAIR Washington DC
*Telex:*892-562

1.2 Area of Responsibility

Communications services are available on a continuous basis without charge to the user. The Air Traffic Services Division is responsible for the establishment of the operational requirements of the U.S. communications system. Responsibility for the day to day operation of these services resides with the local air traffic facility. Enquiries or complaints regarding any communications services or facilities should be referred to the relevant air traffic facility or to the Federal Aviation Administration, Air Traffic Operations Services, as appropriate.

2. APPLICABLE ICAO DOCUMENTS

2.1 ICAO Standards, Recommended Practices and Procedures contained in the following documents are applied, with the exceptions (differences) noted hereunder:

Annex 10 Aeronautical Telecommunications
Doc 8400 ICAO Abbreviations and Codes
Doc 8585 Designators for Aircraft Operating Agencies Authorities and Services
Doc 7030 Regional Supplementary Procedures
Doc 7910 Location Indicators

2.2 Differences for ICAO Standards, Recommended Practices and Procedures. See AIP Section DIF.

3. TYPES OF SERVICES

3.1 Radio Navigation Service

3.1.1 Various types of air navigation aids are in use today, each serving a special purpose. These aids have varied owners and operators, namely: the Federal Aviation Administration, the military services, private organizations; and individual states and foreign governments. The Federal Aviation Administration has the statutory authority to establish, operate, and maintain air navigation facilities and to prescribe standards for the operation of any of these aids which are used by both civil and military aircraft for instrument flight in federally controlled airspace. These aids are tabulated in the Airport/Facility Directory by State.

3.1.2 The following types of Radio Navigation Aids are provided in the U.S.:

VHF Direction-Finding (VHF-DF)
LF Non-Directional Beacon (NDB)
VHF Omni-Directional Radio Range (VOR)
Distance Measuring Equipment (DME)
Tactical Air Navigation (TACAN)
Instrument Landing System (ILS)
Final Approach Simplified Directional Facility (SDF)
Interim-Standard Microwave Landing System (ISMLS)
Precision Approach Radar (PAR) at certain military aerodromes
Loran
Omega (OMEGA) and Very Low Frequency (VLF) systems

3.1.3 NAVAID Service Volumes

3.1.3.1 Most air navigation radio aids which provide positive course guidance have a designated standard service volume (SSV). The SSV defines the reception limits of unrestricted NAVAIDS which are usable for random/ unpublished route navigation.

3.1.3.2 A NAVAID will be classified as restricted if it does not conform to flight inspection signal strength and course quality standards throughout the published SSV. However, the NAVAID should not be considered usable at altitudes below that which could be flown while operating under random route IFR conditions; even though these altitudes may lie within the designated SSV.

Note.—Refer to Federal Aviation Regulations FAR-91.177 for Minimum ALtitudes for IFR Operations. Service volume restrictions are first published in the Notices to Airman (NOTAM) and then with the alphabetical listing of the NAVAID's in the Airport/Facility Directory.

3.1.3.3 Standard Service Volume limitations do not apply to published IFR routes or procedures.

3.1.3.4 VOR/DME/TACAN Standard Service Volumes (SSV)

SSV Class Designator	Altitude and Range Boundaries
T (Terminal)	From 1,000 feet above ground level (AGL) up to and including 12,000 feet AGL at radial distances out to 25 NM. See Figures 3 and 4.

SSV Class Designator	Altitude and Range Boundaries
L (Low Altitude)	From 1,000 feet AGL up to and including 18,000 feet AGL at radial distances out to 40 NM. See Figures 2 and 5.
H (High Altitude)	From 1,000 feet AGL up to and including 14,500 feet AGL at radial distances out to 40 NM. From 14,5000 feet AGL up to and including 60,000 feet at radial distances out to 100 NM. From 18,000 feet AGL up to and including 45,000 feet AGL at radial distances out to 130 NM. See Figures 1 and 5.

These standard service volumes (SSV's) are graphically shown in Figures 1 through 5. The SSV of a station is indicated by using the class designator as a prefix to the station type designation. (Examples: TVOR, LDME, and HVORTAC.) Within 25 NM, the bottom line of the T service volume is defined by the curve in Figure 4. Within 40 NM, the bottoms of the L and H service volumes are defined by the curve in Figure 5.

3.1.3.5 Nondirectional Radio Beacon (NDB)

NDBs are classified according to their intended use. The ranges of NDB service volumes are shown below. The distances (radius) are the same at all altitudes.

Class	Distance (Radius)
Compass Locator	15 NM
MH	25 NM
H	50 NM*
HH	75 NM

* Service ranges of individual facilities may be less than 50 nautical miles (NM). Restrictions to service volumes are first published in the Notice to Airmen and then with the alphabetical listing of the NAVAID in the Airport/Facility Directory.

3.1.4 NAVAIDS with Voice Feature

3.1.4.1 Voice equipped enroute radio navigational aids are under the operational control of either an FAA AFSS or an approach control facility. The voice communication is available on some facilities. The HIWAS broadcast capability on selected VOR sites is in the process of being implemented throughout the conterminous United States and does not provide voice communication. The availability of two-way voice communication and HIWAS is indicated in the Airport Facility Directory and aeronautical charts.

3.1.4.2 Unless otherwise noted on the chart, all radio navigation aids operate continuously except during shutdowns for maintenance. Hours of operation of facilities not operating continuously are annotated on charts and in the Airport/Facility Directory.

3.1.5 Marker Beacon

3.1.5.1 Marker beacons identify a particular location along an airway or on the approach to an instrument runway. This is done by means of a 75-MHz transmitter which transmits a directional signal to be received by aircraft flying overhead. These markers are generally used in conjunction with en route navaids and the Instrument Landing Systems as point designators.

3.1.5.2 The class FM fan markers are used to provide a positive identification of positions at definite points along the airways. The transmitters have a power output of approximately 100 watts. Two types of antenna array are used with class FM fan markers. The first type used, and generally referred to as the standard type, produces an elliptical-shaped pattern, which at an elevation of 1,000 feet above the station is about four nautical miles wide and 12 nautical miles long. At 10,000 feet the pattern widens to about 12 nautical miles wide and 35 nautical miles long.

3.1.5.3 The second array produces a dumbell or boneshaped pattern, which at the "handle" is about three miles wide at 1,000 feet. The boneshaped marker is preferred at approach control locations where "timed" approaches are used.

3.1.5.4 The class LFM, or low-powered fan markers have a rated power output of 5 watts. The antenna array produces a circular pattern which appears elongated at right angles to the airway due to the directional characteristics of the aircraft receiving antenna.

3.1.5.5 The Station Location, or Z-Marker, was developed to meet the need for a positive position indicator for aircraft operating under instrument flying conditions to show the pilot when he was passing directly over a Low Frequency navigational aid. The marker consists of a 5-watt transmitter and a directional antenna array which is located on the range plot between the towers or the loop antennas.

3.1.5.6 ILS marker beacon information is included under Instrument Landing System (Para. 4.6).

3.2 Mobile Service

3.2.1 The Aeronautical Stations (Airport Traffic Control Towers, Air Route Traffic Control Centers and Flight Service Stations) maintain a continuous watch on their assigned frequencies during the published hours of service unless otherwise notified. An aircraft should normally communicate with the air-ground control radio station which exercises control in the area in which it is flying. Aircraft should maintain continuous watch on the appropriate frequency of the control station and should not abandon watch, except in an emergency, without informing the control radio station.

3.2.2 Flight Service Stations are allocated frequencies for different functions, for Airport Advisory Service the pilot should contact the FSS on 123.6 MHz, for example. Individual assigned FSS frequencies are listed in Airport/Facility Directory under the FSS entry. If you are in doubt as to what frequency to use to contact an FSS, transmit on 122.1 MHz and advise them of the frequency you are receiving on.

3.3 Fixed Service

3.3.1 Messages to be transmitted over the Aeronautical Fixed Service are accepted only if they satisfy the requirements of:

(a) ICAO Annex 10, Vol. II, Chapter 3, para. 3.3;

(b) Are prepared in the form specified in Annex 10;

(c) And the text of an individual message does not exceed 200 groups.

3.3.2 General aircraft operating messages, class B traffic, including reservation messages pertaining to flights scheduled to depart within 72 hours, shall not be acceptable for transmission over U.S. government operated telecommunications circuits except in those cases where it has been determined by the U.S. that adequate non-government facilities are not available.

3.4 Broadcast Service

3.4.1 The following meteorological broadcasts are available for the use of aircraft in flight:

(a) LF Transcribed Weather Broadcast (TWEB)

(b) Sub-Area Meteorological Broadcast (Volmet)

(c) VHF RTF Meteorological Broadcasts

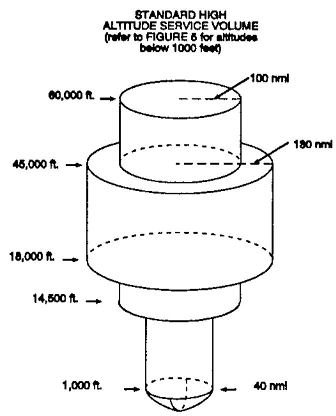


FIGURE 1. STANDARD HIGH ALTITUDE SERVICE VOLUME (refer to FIGURE 5 for altitudes below 1000 feet)

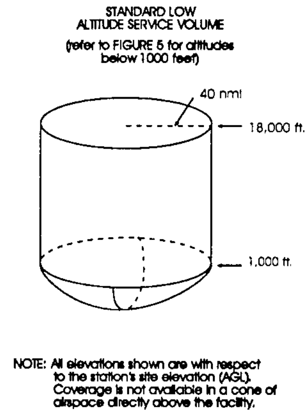


FIGURE 2. STANDARD LOW ALTITUDE SERVICE VOLUME (refer to FIGURE 5 for altitudes below 1000 feet)

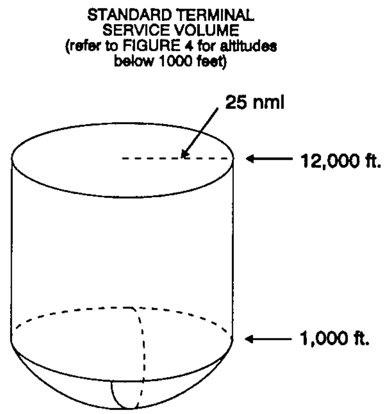


FIGURE 3. STANDARD TERMINAL SERVICE VOLUME (refer to FIGURE 4 for altitudes below 1000 feet)

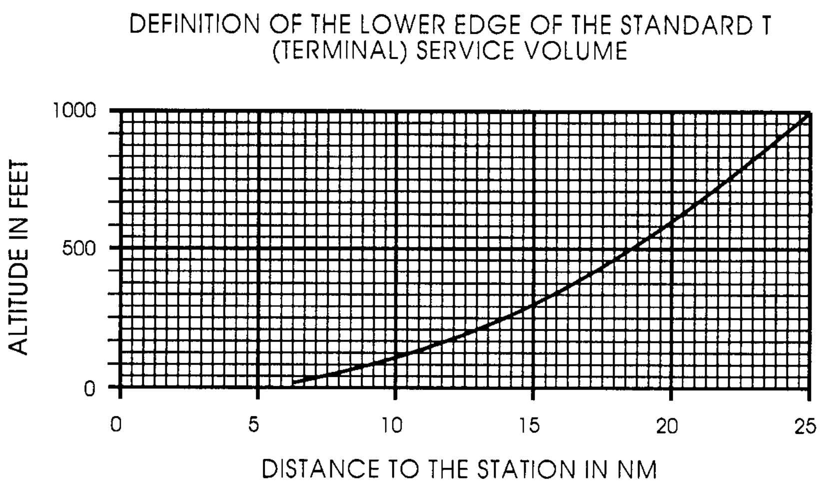


FIGURE 4. DEFINITION OF THE LOWER EDGE OF THE STANDARD T (TERMINAL) SERVICE VOLUME

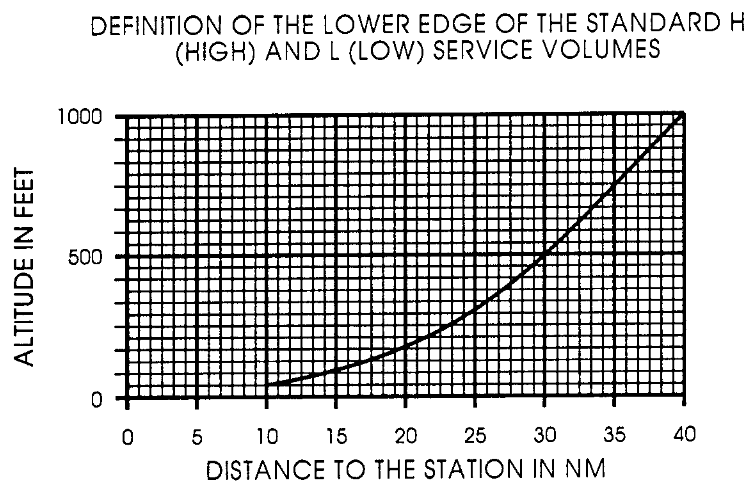


FIGURE 5. DEFINITION OF THE LOWER EDGE OF THE STANDARD H (HIGH) AND L (LOW) SERVICE VOLUMES

3.4.2 Full details of broadcast service are given in MET 3.

3.4.3 All broadcast services are provided in the English language only.

4. RADIO NAVIGATION AIDS

4.1 VHF Direction-Finding Station (VHF)

4.1.1 TheVHF/DF is one of the Common Systems that helps pilots without their being aware of its operation. It is a ground-based radio receiver used by the operator of the ground station. FAA facilities that provide VHF/DF service are identified in the Airport/Facility Directory.

4.1.2 The equipment consists of a directional antenna system and a VHF radio receiver.

4.1.3 The VHF/DF receiver display indicates the magnetic direction of the aircraft from the ground station each time the aircraft transmits.

4.1.4 DF equipment is of particular value in locating lost aircraft and in helping to identify aircraft on radar.

4.2 Non-directional Radio Beacon (NDB)

4.2.1 A low or medium-frequency radio beacon which transmits nondirectional signals whereby the pilot of an aircraft equipped with a loop antenna can determine his bearing and "home" on the station. These facilities normally operate in the frequency band of 190 to 535 kHz and transmit a continuous carrier with either 400 Hz or 1020 Hz modulation. All radio beacons except the compass locators transmit a continuous three-letter identification in code except during voice transmissions.

4.2.2 When a radio beacon is used in conjunction with the Instrument Landing System markers, it is called a Compass Locator.

4.2.3 Voice transmissions are made on radio beacons unless the letter "W" (without voice) is included in the class designator (HW).

4.2.4 Radio beacons are subject to disturbances that may result in erroneous bearing information. Such disturbances result from such factors as lightning, precipitation, static, etc. At night radio beacons are vulnerable to interference from distant stations. Nearly all disturbances which affect the Aircrafts Automatic Direction Finder (ADF) bearing also affect the facility's identification. Noisy identification usually occurs when the ADF needle is erratic; voice, music, or erroneous identification will usually be heard when a steady false bearing is being displayed. Since ADF receivers do not have a "FLAG" to warn the pilot when erroneous bearing information is being displayed, the pilot should continuously monitor the NDB's identification.

4.3 VHF Omni-directional Radio Range (VOR)

4.3.1 VOR's operate within the 108.0 — 117.95 MHz frequency band and have a power output necessary to provide coverage within their assigned operational service volume. They are subject to line-of-sight restrictions, and its range varies proportionally to the altitude of the receiving equipment. The normal service ranges for the various classes of VOR's are given in Para 3.1.3.4.

4.3.1.1 Most VOR's are equipped for voice transmission on the VOR frequency. VORs without voice capability are indicated by the letter "W" (without voice) included in the class designator (VORW).

4.3.1.2 The effectiveness of the VOR depends upon proper use and adjustment of both ground and airborne equipment.

4.3.1.2.1 Accuracy: The accuracy of course alignment of the VOR is excellent, being generally plus or minus 1 Degree.

4.3.1.2.2 Roughness: On some VORs, minor course roughness may be observed, evidenced by course needle or brief flag alarm activity (some receivers are more subject to these irregularities than others). At a few stations, usually in mountainous terrain, the pilot may occasionally observe a brief course needle oscillation, similar to the indication of "approaching station." Pilots flying over unfamiliar routes are cautioned to be on the alert of these vagaries, and, in particular, to use the "to-from" indicator to determine positive station passage.

4.3.1.2.2.1 Certain propeller RPM settings or helicopter rotor speeds can cause the VOR Course Deviation Indicator to fluctuate as much as plus or minus six degrees. Slight changes to the RPM setting will normally smooth out this roughness. Pilots are urged to check for this modulation phenomenon prior to reporting a VOR station or aircraft equipment for unsatisfactory operation.

4.3.1.3 The only positive method of identifying a VOR is by its Morse Code identification or by the recorded automatic voice identification which is always indicated by use of the word "VOR" following the range's name. Reliance on determining the identification of an omnirange should never be placed on listening to voice transmissions by the Flight Service Station (FSS) (or approach control facility) involved. Many FSS remotely operate several omniranges which have different names from each other and, in some cases, none have the name of the "parent" FSS. (During periods of maintenance the facility may radiate a T-E-S-T code (- . ... -) or the code may be removed.)

4.3.1.4 Voice identification has been added to numerous VORs. The transmission consists of a voice announcement, i.e., "AIRVILLE VOR", alternating with the usual Morse Code identification.

4.3.2 *VOR Receiver Check*

4.3.2.1 Periodic VOR receiver calibration is most important. If a receiver's Automatic Gain Control or modulation circuit deteriorates, it is possible for it to display acceptable accuracy and sensitivity close in the the VOR or VOT and display out-of-tolerance readings when located at greater distances where weaker signal areas exist. The likelihood of this deterioration varies between receivers, and is generally considered a function of time. The best assurance of having an accurate receiver is periodic calibration. Yearly intervals are recommended at which time an authorized repair facility should recalibrate the receiver to the manufacturer's specifications.

4.3.2.2 Part 91.171 of the Federal Aviation Regulations provides for certain VOR equipment accuracy checks prior to flight under instrument flight rules. To comply with this requirement and to ensure satisfactory operation of the airborne system, the FAA has provided pilots with the following means of checking VOR receiver accuracy: (1) FAA VOR test facility (VOT) or a radiated test signal from an appropriately rated radio repair station, (2) certified airborne check points, and (3) certified check points on the airport surface.

4.3.2.2.1 The FAA VOR test facility (VOT) transmits a test signal which provides a convenient means to determine the operational status and accuracy of a VOR receiver while on the ground where a VOT is located. The airborne use of VOT is permitted; however, its use is strictly limited to those areas/altitudes specifically authorized in the Airport/Facility Directory or appropriate supplement. To use the Vot service, tune in the VOT frequency on your VOR receiver. With the Course Deviation Indicator (CDI) centered, the omni-bearing selector should read 0° with the to-from indicator showing "from," or the omni-bearing selector should read 180° with the to-from indicator showing "to." Should the VOR receiver operate a radio magnetic indicator (RMI), it will indicate 180° on any OBS setting. Two means of identification are used. One is a series of dots and the other is a continuous tone. Information concerning an individual test signal can be obtained from the local flight service station.

4.3.2.2.2 A radiated VOR test signal from an appropriately rated radio repair station serves the same purpose as an FAA VOR signal and the check is made in much the same manner as a VOT with the following differences: (1) the frequency normally approved by the FCC is 108.0 MHz; (2) repair stations are not permitted to radiate the VOR test signal continuously, consequently the owner/operator must make arrangements with the repair station to have the test signal transmitted. This service is not provided by all radio repair stations. The aircraft owner/operator must determine which repair station in his local area provides this service. A representative of the repair station must make an entry into the aircraft logbook or other permanent record certifying to the radial accuracy and the date of transmission. The owner/operator or representative of the repair station may accomplish the necessary checks in the aircraft and make a logbook entry stating the results. It is necessary to verify which test radial is being transmitted and whether you should get a "to" or "from" indication.

4.3.2.2.3 Airborne and ground check points consist of certified radials that should be received at specific points on the airport surface, or over specific landmarks while airborne in the immediate vicinity of the airport.

4.3.2.2.4 Should an error in excess of ±4° be indicated through use of a ground check, or ±6° using the airborne check, IFR flight shall not be attempted without first correcting the source of the error. CAUTION: no correction other than the "correction card" figures supplied by the manufacturer should be applied in making these VOR receiver checks.

4.3.2.2.5 Airborne check points, ground check points and VOTs are included in the Airport/Facility Directory.

4.3.2.2.6 If a dual system VOR (units independent of each other except for the antenna) is installed in the aircraft, one system may be checked against the other. Turn both systems to the same VOR ground facility and note the indicated bearing to that station. The maximum permissible variations between the two indicated bearings is 4°.

4.4 Distance Measuring Equipment (DME)

4.4.1 In the operation of DME, paired pulses at a specific spacing are sent out from the aircraft (this is the interrogation) and are received at the ground station. The ground station (transponder) than transmits paired pulses back to the aircraft at the same pulse spacing but on a different frequency. The time required for the round trip of this signal exchange is measured in the airborne DME unit and is translated into distance (Nautical Miles) from the aircraft to the ground station.

4.4.2 Operating on the line-of-sight principle, DME furnishes distance information with a very high degree of accuracy. Reliable signals may be received at distances up to 199 NM at line-of-sight altitude with an accuracy of better than ½ mile or 3% of the distance, whichever is greater. Distance information received from DME equipment is SLANT RANGE distance and not actual horizontal distance.

4.4.3 DME operates on frequencies in the UHF spectrum between 962 MHz and 1213 MHz. Aircraft equipped with TACAN equipment will receive distance information from a VORTAC automatically, while aircraft equipped with VOR must have a separate DME airborne unit.

4.4.4 VOR/DME, VORTAC, ILS/DME, and LOC/DME navigation facilities established by the FAA provide course and distance information from colocated components under a frequency pairing plan. Aircraft receiving equipment which provides for automatic DME selection assures reception of azimuth and distance information from a common source whenever designated VOR/DME, VORTAC, ILS/DME, and LOC/DME are selected.

4.4.5 Due to the limited number of available frequencies, assignment of paired frequencies is required for certain military non-colocated VOR and TACAN facilities which serve the same area but which may be separated by distances up to a few miles. The military is presently undergoing a program to colocate VOR and TACAN facilities or to assign non-paired frequencies to those facilities that cannot be colocated.

4.4.6 VOR/DME, VORTAC, ILS/DME, and LOC/DME facilities are identified by synchronized identifications which are transmitted on a time share basis. The VOR or localizer portion of the facility is identified by a coded tone modulated at 1020 Hz or by a combination of code and voice. The TACAN or DME is identified by a coded tone modulated at 1350 Hz. The DME or TACAN coded identification is transmitted one time for each three or four times that the VOR or localizer coded identification is transmitted. When either the VOR or the DME is inoperative, it is important to recognize which identifier is retained for the operative facility. A signal coded identification with a repetition interval of approximately 30 seconds indicates that the DME is operative.

4.4.7 Aircraft equipment which provides for automatic DME selection assures reception of azimuth and distance information from a common source whenever designated VOR/DME, VORTAC and ILS/DME navigation facilities are selected. Pilots are cautioned to disregard any distance displays from automatically selected DME equipment when VOR or ILS facilities, which do not have the DME feature installed, are being used for position determination.

4.5 Tactical Air Navigation (TACAN)

4.5.1 For reasons peculiar to military or naval operations (unusual siting conditions, the pitching and rolling of a naval vessel, etc.) the civil VOR-DME system of air navigation was considered unsuitable for military or naval use. A new navigational system, Tactical Air Navigation (TACAN), was therefore developed by the military and naval forces to more readily lend itself to military and naval requirements. As a result, the FAA has been in the process of integrating TACAN facilities with the civil VOR-DME program. Although the theoretical, or technical principles of operation of TACAN equipment are quite different from those of VOR-DME facilities, the end result, as far as the navigating pilot is concerned, is the same. These integrated facilities are called VORTAC's.

4.5.2 VORTAC is a facility consisting of two components, VOR and TACAN, which provides three individual services: VOR azimuth, TACAN azimuth and TACAN distance (DME) at one site. Although consisting of more than one component, incorporating more than one operating frequency, and using more than one antenna system, a VORTAC is considered to be a unified navigational aid. Both components of a VORTAC are envisioned as operating simultaneously and providing the three services at all times.

4.5.3 Transmitted signals of VOR and TACAN are each identified by three-letter code transmission and are interlocked so that pilots using VOR azimuth and TACAN distance can be assured that both signals being received are definitely from the same ground station. The frequency channels of the VOR and the TACAN at each VORTAC facility are "paired" in accordance with a national plan to simplify airborne operation.

4.5.4 TACAN ground equipment consists of either a fixed or mobile transmitting unit. The airborne unit in conjunction with the ground unit reduces the transmitted signal to a visual presentation of both azimuth and distance information. TACAN is a pulse system and operates in the UHF band of frequencies. Its use requires TACAN airborne equipment and does not operate through conventional VOR equipment.

4.6 Instrument Landing System (ILS)

4.6.1 *General*

4.6.1.1 The ILS is designed to provide an approach path for exact alignment and descent of an aircraft on final approach to a runway.

4.6.1.2 The ground equipment consists of two highly directional transmitting systems and, along the approach, three (or fewer) marker beacons. The directional transmitters are known as the localizer and glide slope transmitters.

4.6.1.3 The system may be divided functionally into three parts:

Guidance information —localizer, glide slope

Range information —marker beacon, DME

Visual information —approach lights, touchdown and centerline lights, runway lights

4.6.1.4 Compass locators located at the outer marker or middle marker may be substituted for these marker beacons. DME when specified in the procedure may be substituted for the outer marker.

4.6.1.5 Where a complete ILS system is installed on each end of a runway; (i.e. the approach end of runway 4 and the approach end of runway 22), the ILS systems are not in service simultaneously.

4.6.2 *Localizer*

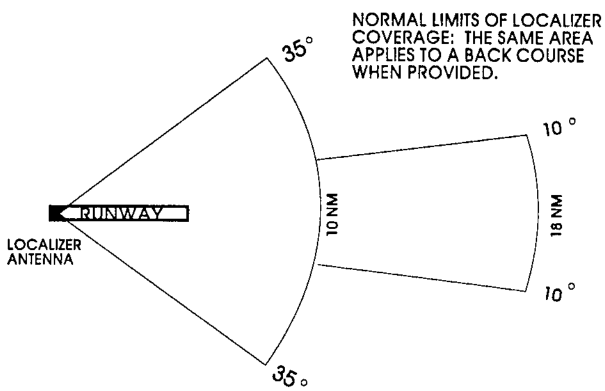
4.6.2.1 The localizer transmitter, operates on one of 40 ILS channels within the frequency range of 108.10 MHz to 111.95 MHz. Signals provide the pilot with course guidance to the runway centerline.

4.6.2.2 The approach course of the localizer is called the front course and is used with other functional parts, e.g., glide slope marker beacons, etc. The localizer signal is transmitted at the far end of the runway. It is adjusted for a course width of (full scale fly-left to a full scale fly-right) of 700 feet at the runway threshold.

4.6.2.3 The course line along the extended centerline of a runway, in the opposite direction to the front course, is called the back course. CAUTION — unless your aircraft's ILS equipment includes reverse sensing capability, when flying inbound on the back course it is necessary to steer the aircraft in the direction opposite of the needle deflection on the airborne equipment when making corrections from off-course to on-course. This "flying away from the needle" is also required when flying outbound on the front course of the localizer. DO NOT USE BACK COURSE SIGNALS for approach unless a BACK COURSE APPROACH PROCEDURE is published for that particular runway and the approach is authorized by ATC.

4.6.2.4 Identification is in international Morse Code and consists of a three-letter identifier preceded by the letter I (..) transmitted on the localizer frequency. (Example: I-DIA).

4.6.2.5 The localizer provides course guidance throughout the descent path to the runway threshold from a distance of 18 NM from the antenna between an altitude of 1,000 feet above the highest terrain along the course line and 4,500 feet above the elevation of the antenna site. Proper off-course indications are provided throughout the following angular areas of the operational service volume: (a) to 10° either side of the course along a radius of 18 NM from the antenna, and (b) from 10° — 35° either side of the course along a radius of 10 NM.



NORMAL LIMITS OF LOCALIZER COVERAGE; THE SAME AREA APPLIES TO A BACK COURSE WHEN PROVIDED

4.6.2.6 Unreliable signals may be received outside these areas.

4.6.3 *Localizer-Type Directional Aid*

4.6.3.1 The localizer-type directional aid (LDA) is of comparable use and accuracy to a localizer but is not part of a complete ILS. The LDA course usually provides a mor precise approach course than the similar Simplified Directional Facility (SDF) installation, which may have a course width of 6° or 12°. The LDA is not aligned with the runway. Straight-in minimums may be published where alignment does not exceed 30 degrees between the course and runway. Circling minimums only are published where this alignment exceeds 30 degrees.

4.6.4 *Glide Slope/Glide Path*

4.6.4.1 The UHF glide slope transmitter, operating on one of the forty ILS channels within the frequency range 329.15 MHz, to 335.00 MHz radiates its signals in the direction of the localizer front course.

Caution: False glide slope signals may exist in the area of the localizer back course approach which can cause the glide slope flag alarm to disappear and present unreliable glide slope information. Disregard all glide slope signal indications when making a localizer back course approach unless a glide slope is specified on the approach and landing chart.

4.6.4.2 The glide slope transmitter is located between 750 and 1,250 feet from the approach end of the runway (down the runway) and offset 250-600 feet from the runway centerline. It transmits a glide path beam 1.4 degrees wide.

Note. — The term "glide path" means that portion of the glide slope that intersects the localizer.

4.6.4.3 The glide path projection angle is normally adjusted to 3 degrees above horizontal so that it intersects the middle marker at about 200 feet and the outer marker at about 1,400 feet above the runway elevation. The glide slope is normally usable to the distance of 10 NM. However, at some locations, the glide slope has been certified for an extended service volume which exceeds 10 NM.

4.6.4.4 Pilots must be alert when approaching glidepath interception. False courses and reverse sensing will occur at angles considerably greater than the published path.

4.6.4.5 Make every effort to remain on the indicated glide path (reference: FAR 91.129(d)(2)). Exercise caution: avoid flying below the glide path to assure obstacle/terrain clearance is maintained.

4.6.4.6 A glide slope facility provides descent information for navigation down to the lowest authorized decision height (DH) specified in the approved ILS approach procedure. The glidepath may not be suitable for navigation below the lowest authorized DH and any reference to glidepath indications below that height must be supplemented by visual reference to the runway environment. Glide slopes with no published DH are usable to runway threshold.

4.6.4.7 The published glide slope threshold crossing height (TCH) DOES NOT represent the height of the actual glide slope on course indication above the runway threshold. It is used as a reference for planning purposes which represents the height above the runway threshold that an aircraft's glide slope antenna should be, if that aircraft remains on a trajectory formed by the four-mile-to-middle marker glidepath segment.

4.6.4.8 Pilots must be aware of the vertical height between the aircraft's glide slope antenna and the main gear in the landing configuration and, at the DH, plan to adjust the descent angle accordinaly if the published TCH indicates the wheel crossing height over the runway threshold may be be satisfactory. Tests indicate a comfortable wheel crossing height is approximately 20 to 30 feet, depending on the type of aircraft.

4.6.5 *Distance Measuring Equipment (DME)*

4.6.5.1 When installed with an ILS and specified in the approach procedure, DME may be used in lieu of:

(a) The outer marker

(b) A back course final approach fix (FAF)

(c) For ARC initial approach courses.

4.6.5.2 In some cases DME from a separate facility may be prescribed for use.

4.6.6 *Marker Beacon*

4.6.6.1 ILS marker beacons have a rated power output of 3 watts or less and an antenna array designed to produce an elliptical pattern with dimensions, at 1,000 feet above the antenna, of approximately 2,400 feet in width and 4,200 feet in length. Airborne marker beacon receivers with a selective sensitivity feature should always be operated in the "low" sensitivity position for proper reception of ILS marker beacons.

4.6.6.2 Ordinarily, there are two marker beacons associated with an instrument landing system; the outer marker and middle marker. Locations with a Category II and III ILS also have an inner marker (IM). When an aircraft passes over a marker, the pilot will receive the following indications:

MARKER	CODE	LIGHT
OM	---	BLUE
MM	.-.-	AMBER
IM	....	WHITE
BC	....	WHITE

4.6.6.3 The outer marker (OM) normally indicates a position at which an aircraft at the appropriate altitude on the localizer course will intercept the ILS glide path.

4.6.6.4 The middle marker (MM) indicates a position approximately 3,500 feet from the landing threshold. This will also be the position where an aircraft on the glide path will be at an altitude of approximately 200 feet above the elevation of the touchdown zone.

4.6.6.5 The inner marker (IM) indicates a point at which an aircraft is at a designated decision height (DH) on the glide path between the middle marker and landing threshold.

4.6.6.6 A back course marker, normally indicates the ILS back course final approach fix where approach descent is commenced.

4.6.7 *Compass Locator*

4.6.7.1 Compass locator transmitters are often situated at the middle and outer marker sites. The transmitters have a power of less than 25 watts, a range of at least 15 miles and operate between 190 and 535 kHz. At some locations, higher-powered radio beacons, up to 400 watts, are used as outer marker compass locators. These generally carry Transcribed Weather Broadcast (TWEB) information.

4.6.7.2 Compass locators transmit two-letter identification groups. The outer locator transmits the first two letters of the localizer identification group, and the middle locator transmits the last two letters of the localizer identification group.

4.6.8 *ILS Graphic Presentation*

See Appendix One.

4.6.9 *ILS Minimums*

4.6.9.1 The lowest authorized ILS minimums, with all required ground and airborne systems components operative, are:

(a) Category I — Decision Height (DH) 200 feet and Runway Visual Range (RVR) 2,400 feet (with touchdown zone and centerline lighting, RVR 1800 Category A, B, C; RVR 2000 Category D),

(b) Category II — DH 100 feet and RVR, 1,200 feet,

(c) Category III — RVR 700 feet.

Note. — Special authorization and equipment are required for category II and III A.

4.6.10 *Inoperative ILS Components*

4.6.10.1 Inoperative Localizer: When the localizer fails, an ILS approach is not authorized.

4.6.10.2 Inoperative Glide Slope: When the glide slope fails, the ILS reverts to a non-precision localizer approach.

Note. — Refer to the inoperative Component Table in the U.S. Government Instrument Approach Procedures publications, Supplementary Information Section, for adjustments to minimums due to inoperative airborne or ground system equipment.

4.6.11 *ILS Frequencies*

The following frequency pairs are allocated for ILS.

ILS

Localizer MHz	Glide Slope MHz	Localizer MHz	Glide Slope MHz
108.10	334.70	110.1	334.40
108.15	334.55	110.15	334.25
108.3	334.10	110.3	335.00
108.35	333.95	110.35	334.85
108.5	329.90	110.5	329.60
108.55	329.75	110.55	329.45
108.7	330.50	110.70	330.20
108.75	330.35	110.75	330.05
108.9	329.30	110.90	330.80
108.95	329.15	110.95	330.65
109.1	331.40	111.10	331.70
109.15	331.25	111.15	331.55
109.3	332.00	111.30	332.30
109.35	331.85	111.35	332.15
109.50	332.60	111.50	332.9
109.55	332.45	111.55	332.75
109.70	333.20	111.70	333.5
109.75	333.05	111.75	333.35
109.90	333.80	111.90	331.1
109.95	333.65	111.95	330.95

4.6.12 *ILS Course Distortion*

4.6.12.1 ALL PILOTS SHOULD BE AWARE that disturbance to ILS localizer/glide slope courses may occur when surface vehicles/aircraft are operated near the localizer/glide slope antennas. Most ILS installations are subject to signal interference by either surface vehicles, aircraft or both. ILS "CRITICAL AREAS" are established near each localizer and glide slope antenna.

4.6.12.2 Air traffic control issues control instructions to avoid interfering operations within ILS critical areas at controlled airports during the hours the airport traffic control tower is in operations as follows:

4.6.12.2.1 Weather Conditions — At or above 800 feet and/or visibility 2 miles.

4.6.12.2.1.1 No critical area protection action is provided.

4.6.12.2.1.2 If an aircraft advises the TOWER that an "AUTOLAND"/"COUPLED" approach will be conducted, an advisory will be promptly issued if a vehicle/aircraft will be in or over a critical area when the arriving aircraft is inside the ILS middle marker.

Example:

GLIDE SLOPE SIGNAL NOT PROTECTED.

4.6.12.2.2 Weather Conditions — Less than ceiling 800 feet and/or visibility 2 miles.

4.6.12.2.2.1 GLIDE SLOPE CRITICAL AREA — Vehicles, aircraft are not authorized in the area when an arriving aircraft is between the ILS final approach fix and the airport unless the aircraft has reported the airport in sight and is circling or side stepping to land on other than the ILS runway.

4.6.12.2.2.2 LOCALIZER CRITICAL AREA — Except for aircraft that land, exit a runway, depart or miss approach, vehicles and aircraft are not authorized in or over the critical area when an arriving aircraft is between the ILS final approach fix and the airport. Additionally, when the ceiling is less than 200 feet and/or the visibility is RVR 2,000 or less, vehicle/aircraft operations in or over the area are not authorized when an arriving aircraft is inside the ILS middle marker.

4.6.12.3 Aircraft holding below 5000 feet between the outer marker and the airport may cause localizer signal variations for aircraft conducting the ILS Approach. Accordingly, such holding is not authorized when weather or visibility conditions are less than ceiling 800 feet and/or visibility 2 miles.

4.6.12.4 Pilots are cautioned that vehicular traffic not subject to control by ATC may cause momentary deviation to ILS course/glide slope signals. Also,"critical areas" are not protected at uncontrolled airports or at airports with an operating control tower when weather/visibility conditions are above those requiring protective measures. Aircraft conducting "coupled" or "autoland" operations should be especially alert in monitoring automatic flight control systems.

4.6.13 Continuous Power Facilities

In order to insure that a basic ATC system remains in operation despite an area wide or catastrophic commercial power failure, key equipments and certain airports have been designated to provide a network of facilities whose operational capability can be utilized independent of any commercial power supply.

4.6.13.1 In addition to those facilities comprising the basic ATC system, the following approach and lighting aids have been included in this program for a selected runway.

1. ILS (Localizer, Glide Slope, COMLO, Inner, Middle and Outer Markers)
2. Wind Measuring Capability
3. Approach Light System (ALS) or Short ALS (SALS)
4. Ceiling Measuring Capability
5. Touchdown Zone Lighting (TDZL)
6. Centerline Lighting (CL)
7. Runway Visual Range (RVR)
8. High Intensity Runway Lighting (HIRL)
9. Taxiway Lighting
10. Apron Light (Perimeter Only)

4.6.13.2 The following have been designated "Continuous Power Airports," and have independent back up capability for the equipment installed.

Airport/Ident	*Runway No.*
Albuquerque (ABQ)	08
Andrews AFB (ADW)	1L
Atlanta (ATL)	9R
Baltimore (BWI)	10
Bismarck (BIS)	31
Boise (BOI)	10R
Boston (BOS)	4R
Chicago (ORD)	14R
Charlotte (CLT)	36L
Cincinnati (CVG)	36
Cleveland (CLE)	5R
Dallas/Ft Worth (DFW)	17L
Denver (DEN)	35R
Des Moines (DSM)	30R
Detroit (DTW)	3L
El Paso (ELP)	22
Great Falls (GTF)	03
Houston (IAH)	08
Indianapolis (IND)	4L
Jacksonville (JAX)	07
Kansas City (MCI)	19
Los Angeles (LAX)	24R
Memphis (MEM)	35L
Miami (MIA)	9L
Milwaukee (MKE)	01
Minneapolis (MSP)	29L
Nashville (BNA)	2L
Newark (EWR)	4R
New Orleans (MSY)	10
New York (JFK)	4R
New York (LGA)	22
Oklahoma City (OKC)	35R
Omaha (OMA)	14
Ontario, Calif (ONT)	26R
Philadelphia (PHL)	9R
Phoenix (PHX)	08R
Pittsburgh (PIT)	10L
Reno (RNO)	16
Salt Lake City (SLC)	34L
San Antonio (SAT)	12R
San Diego (SAN)	09
San Francisco (SFO)	28R
St Louis (STL)	24
Seattle (SEA)	16R
Tampa (TPA)	36L
Tulsa (TUL)	35R
Washington (DCA)	36
Washington (IAD)	1R
Wichita (ICT)	01

Note. — The existing CPA runway is listed. Pending and future changes at some locations will require a revised runway designation.

4.7 *Simplified Directional Facility (SDF)*

4.7.1 The SDF provides a final approach course similar to that of the ILS localizer. A clear understanding of the ILS localizer and the additional factors listed below completely describe the operational characteristics and use of the SDF.

4.7.2 The SDF transmits signals within the range of 108.10 to 111.95 MHz. It provides no glide slope information.

4.7.3 Approach techniques and procedures used in an SDF instrument approach are essentially those employed in executing a standard no-glide-slope localizer approach except the SDF course may not be aligned with the runway and the course may be wider, resulting in less precision.

4.7.4 Usable off-course indications are limited to 35° either side of the course centerline. Instrument indications received beyond 35 degrees should be disregarded.

4.7.5 The SDF antenna may be offset from the runway centerline. Because of this, the angle of convergence between the final approach course and the runway bearing should be determined by reference to the instrument approach procedure chart. This angle is generally not more than 3°. However, it should be noted that inasmuch as the approach course originates at the antenna site, an approach which is continued beyond the runway threshold will lead the aircraft to the SDF offset position rather than along the runway centerline.

4.7.6 The SDF signal is fixed at either 6 degrees or 12 degrees as necessary to provide maximum "fly ability" and optimum course quality.

4.7.7 Identification consists of a three letter identifier transmitted on the SDF frequency. Example: SAN, ETT, etc. The appropriate instrument approach chart will indicate the identifier used at a particular airport.

4.8 Microwave Landing System (MLS)

4.8.1 *General*

4.8.1.1 The MLS provides precision navigation guidance for exact alignment and descent of aircraft on approach to a runway. It provides azimuth, elevation and distance information. The elevation transmitter is located to the side of the runway near the approach threshold. The Prescision DME, which provides range information, is normally collocated with the azimuth transmitter.

4.8.1.2 Both lateral and vertical guidance may be displayed on conventional course deviation indicators or incorporated into multipurpose cockpit displays. Range information can be displayed by conventional DME indicators and also incorporated into multipurpose displays.

4.8.1.3 The MLS initially supplements and will eventually replace ILS as the standard landing system in the United States for civil, military and international civil aviation. The transition plan assures duplicate ILS and MLS facilities where needed to protect current users of ILS. At international airports ILS service is protected to the year 1995.

4.8.1.4 The system may be divided into five functions:

a. Approach azimuth

b. Back azimuth

c. Approach elevation

d. Range

e. Data communications

4.8.1.5 *The standard configuration*of MLS ground equipment includes:

4.8.1.5.1 An azimuth station to perform functions (a) and (e) above. In addition to providing azimuth navigation guidance, the azimuth station also transmits basic data which consists of information associated directly with the operation of the landing system, as well as advisory data on the performance of the ground equipment.

4.8.1.5.2 An elevation station to perform function (c) above.

4.8.1.5.3 Precision Distance Measuring Equipment (DME/P) to perform function (d). The DME/P provides continuous range information that is compatible with standard navigation DME but has improved accuracy and additional channel capabilities.

4.8.1.6 MLS Expansion Capabilities. The standard configuration can be expanded by adding one or more of the following functions or characteristics.

4.8.1.6.1 Back azimuth — Provides lateral guidance for missed approach and departure navigation.

4.8.1.6.2 Auxiliary data transmissions — Provides additional data, including refined airborne positioning, meteorological information, runway status, and other supplementary information.

4.8.1.6.3 Larger proportional guidance.

4.8.1.7 MLS identification is a four-letter designation starting with the letter M. It is transmitted in International Morse Code at least six times per minute by the approach azimuth (and back azimuth) ground equipment.

4.8.2 *Approach Azimuth Guidance*

4.8.2.1 The azimuth station transmits MLS angle and data on one of the 200 channels within the frequency range of 5031 to 5091 MHz. See Appendix Three for MLS angle and data channeling, and Appendix Four for the DME.

4.8.2.2 The equipment is normally located about 1,000 feet beyond the stop end of the runway, but there is considerable flexibility in selecting sites. For example, for heliport operations the azimuth transmitter can be collocated with the elevation transmitter.

4.8.2.3 The azimuth coverage (see Appendix Five), extends:

a. Laterally, at least 40 degrees on either side of the runway.

b. In elevation, up to an angle of 15 degrees — and to at least 20,000 feet.

c. In range, to at least 20 NM.

4.8.3 *Back Azimuth Guidance (See Appendix Five)*

4.8.3.1 The back azimuth transmitter is essentially the same as the approach azimuth transmitter. However, the equipment transmits at a somewhat lower data rate because the guidance accuracy requirements are not as stringent as for the landing approach. The equipment operates on the same frequency as the approach azimuth but at a different time in the transmission sequence.

4.8.3.2 The equipment is normally located about 1,000 feet in front of the approach end of the runway. On runways that have MLS service on both ends (e.g. Runway 9 and 27), the azimuth equipments can be switched in their operation from the approach azimuth to the back azimuth and vice versa, and thereby reduce the amount of equipment required.

4.8.3.3 The back azimuth provides coverage as follows:

a. Laterally, at least 40 degrees on either side of the runway.

b. In elevation, up to an angle of 15 degrees.

c. In range, to at least 7 NM from the runway stop end.

Note. — The actual coverage is normally the same as for the approach azimuth.

4.8.4 *Elevation Guidance (See Appendix Five)*

4.8.4.1 The elevation station transmits signals on the same frequency as the azimuth station. A single frequency is time-shared between all angle and data functions.

4.8.4.2 The elevation transmitter is normally located about 400 feet from the side of the runway between runway threshold and the touchdown zone.

4.8.4.3 Elevation coverage is provided in the same airspace as the azimuth guidance signals;

a. In elevation, to at least + 15 degrees.

b. Laterally, 40 degrees on either side of the runway centerline.

c. In range, to at least 20 NM.

4.8.5 *Range Guidance*

4.8.5.1 The MLS Precision Distance Measuring Equipment (DME/P) functions the same as the navigation DME, but with some technical differences. The beacon transponder operates in the frequency band 962 to 1105 MHz and responds to an aircraft interrogator. The MLS DME/P accuracy is improved to be consistent with the accuracy provided by the MLS azimuth and elevation stations.

4.8.5.2 A DME/P channel is paired with the azimuth and elevation channel. A complete listing of the 200 paired channels of the DME/P with the angle functions is contained in FAA Standard 022 (MLS Interoperability and Performance Requirements). For illustrative purposes the first page is shown in Appendix Five.

4.8.5.3 The DME/P is an integral part of the MLS and is installed at all MLS facilities unless a waiver is obtained. This occurs infrequently— and only at outlying, low density airports where marker beacons or compass locators are already in place.

4.8.6 *Data Communications*

4.8.6.1 The data transmission can include both basic and auxiliary data words. All MLS facilities transmit basic data. In the future, facilities at some airports, including most high density airports, will also transmit auxiliary data.

4.8.6.2 Coverage limits: MLS data are transmitted throughout the azimuth (and back azimuth when provided) coverage sectors.

4.8.6.3 Basic Data content — Representative data include:

a. Station identification.

b. Exact locations of azimuth, elevation and DME/P stations (for MLS receiver processing functions).

c. Ground equipment performance level.

d. DME/P channel and status.

4.8.6.4 Auxiliary data content — Representative data include:

a. 3-D locations of MLS equipment.

b. Waypoint coordinates.

c. Runway conditions.

d. Weather (e.g. RVR, ceiling, altimeter setting, wind, wake vortex, wind shear).

4.8.6.5 Operational flexibility. The MLS has the capability to fulfill a variety of needs in the transition, approach, landing, missed approach and departure phases of flight. For example: curved and segmented approaches; selectable glide path angles; accurate 3-D positioning of the aircraft in space; and the establishment of boundaries to ensure clearance from obstructions in the terminal area. While many of these capabilities are available to any MLS-equipped aircraft, the more sophisticated capabilities (such as curved and segmented approaches) are dependent upon the particular capabilities of the airborne equipment.

4.8.7 *Summary*

4.8.7.1 Accuracy. The MLS provides precision three-dimensional navigation guidance — accurate enough for all approach and landing maneuvers.

4.8.7.2 Coverage. Accuracy is consistent throughout the coverage volumes shown in Appendix Five.

4.8.7.3 Environment. The system has low susceptibility to interference from weather conditions and airport ground traffic.

4.8.7.4 Channels. MLS has 200 channels — enough for any foreseeable need.

4.8.7.5 Data. The MLS transmits ground-air data messages associated with system operation.

4.8.7.6 Range information. Continuous range information is provided with an accuracy of about 100 feet.

4.9. *Interim Standard Microwave Landing System (ISMLS)*

4.9.1 The ISMLS is designed to provide approach information similar to the ILS for an aircraft on final approach to a runway. The system provides both lateral and vertical guidance which is displayed on a conventional course deviation indicator or approach horizon. Operational performance and coverage areas are also similar to the ILS as defined above.

4.9.2 ISMLS operates in the C-band microwave frequency range (about 5000 MHz) so the signal will not be received by unmodified VHF/UHF ILS receivers. Aircraft utilizing ISMLS must be equipped with a C-band receiving antenna in addition to other special equipment mentioned below. The C-band antenna limits reception of the signal to an angle of about 50° from the inbound course. An aircraft so equipped will not receive the ISMLS signal until flying a magnetic heading within 50° either side of the inbound course. Because of this ISMLS procedures are designed to restrict the use of the ISMLS signal until the aircraft is in position for the final approach. Transition to the ISMLS, holding and procedure turns at the ISMLS facility must be predicated on other navigation aids such as NDB, VOR, etc. Once established on the approach course inbound, the system can be flown the same as an ILS. No back course is provided.

4.9.3 The Interim Standard Microwave Landing System consists of the following basic components:

C-Band (5000 MHz — 5030 MHz) localizer.
C-Band (5220 MHz — 5250 MHz) glide path.
VHF marker beacons (75 MHz).
A VHF/UHF ILS receiver modified to receive the ISMLS signals.
C-Band antenna.
Converter unit.
A Microwave/ILS Mode Control.

4.9.4 Identification consists of a three letter Morse Code identifier preceded by the Morse Code for "M" (—). Example: "M — STP" The "M" will distinguish this system from ILS which is preceded by the letter "I" (..).

4.9.5 Approaches published in conjunction with the ISMLS are identified as "MLS Rwy — (Interim)." The frequency displayed on the ISMLS approach chart is a VHF frequency.

ISMLS frequencies are tuned by setting the receiver to the listed VHF frequencies. When the ISMLS mode is selected, receivers modified to accept ISMLS signals is a paired C-Band frequency that is processed by the receiver.

CAUTION: Pilots should not attempt to fly ISMLS procedures unless the aircraft is so equipped.

4.10 *Precision Approach Radar (PAR)*

4.10.1 Precision approach radar is designed to be used as a landing aid, rather than an aid for sequencing and spacing aircraft. PAR equipment may be used as a primary landing aid, or it may be used to monitor other types of approaches. It is designed to display*range, azimuth*and*elevation*information.

4.10.2 Two antennas are used in the PAR array, one scanning a vertical plane, and the other scanning horizontally. Since the range is limited to 10 miles, azimuth to 20 degrees, and elevation to 7 degrees, only the final approach area is covered. Each scope is divided into two parts. The upper half presents altitude and distance information, and the lower half presents azimuth and distance.

4.11 Loran

4.11.1 INTRODUCTION

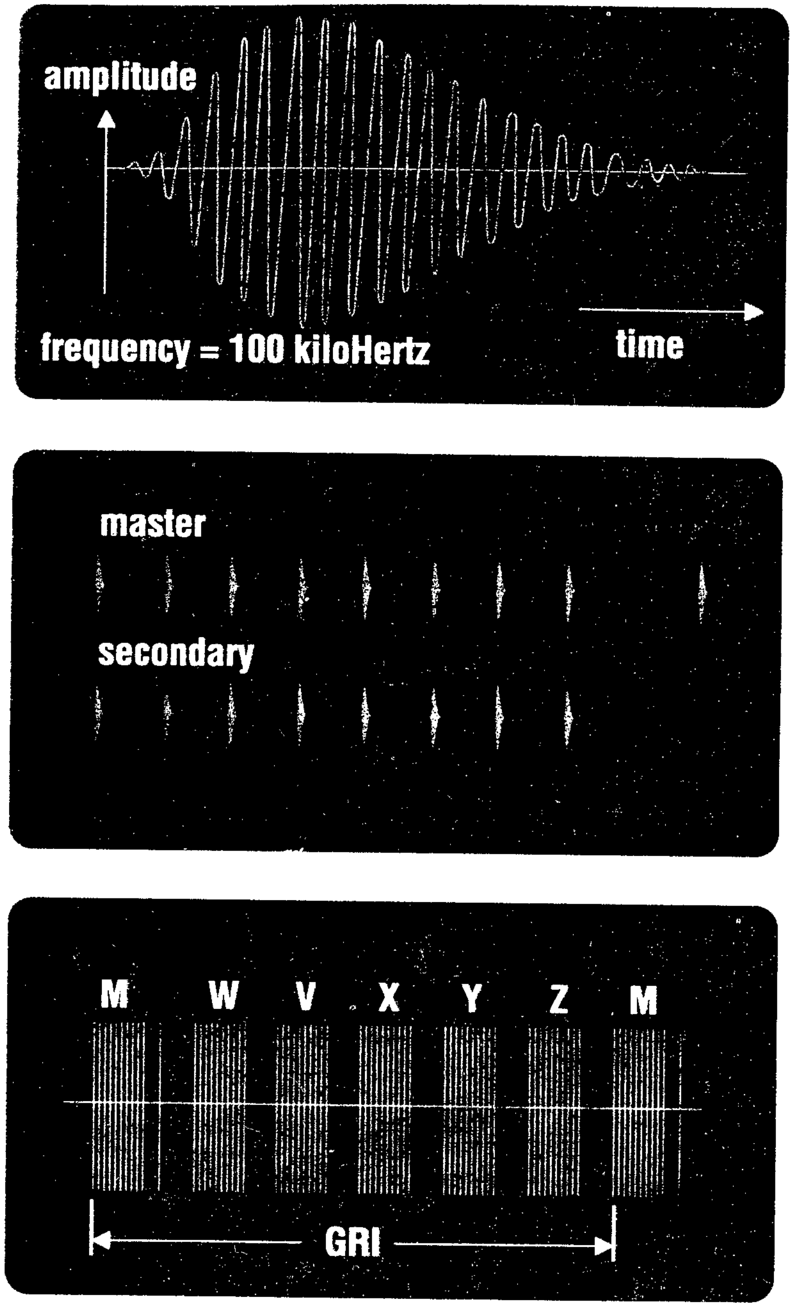
4.11.1.1 Loran, which uses a network of land-based radio transmitters, was developed to provide an accurate system for LOng RAnge Navigation. The system was configured to provide reliable, all weather navigation for marine users along the U.S. coasts and in the Great Lakes. The current system, known as Loran-C, was the third version of four developed since World War II.

4.11.1.2 With an expanding user group in the general aviation community, the Loran coastal facilities were augmented in 1991 to provide signal coverage over the entire continental U.S. The Federal Aviation Administration (FAA) and the United States Coast Guard (USCG) are incorporating Loran into the National Airspace System (NAS) for supplemental en route and nonprecision approach operations. Loran-C is also supported in the Canadian airspace system. This guide is intended to provide an introduction to the Loran system, Loran avionics, the use of Loran for aircraft navigation, and to examine the possible future of Loran in aviation.

4.11.2 LORAN CHAIN

4.11.2.1 The 27 U.S. Loran transmitters that provide signal coverage for the continental U.S. and the southern half of Alaska are distributed from Caribou, Maine to Attu Island in the Aleutians. Station operations are organized into sub-groups of four to six stations called "chains." One station in the chain is designated the "Master" and the others are "secondary" stations.

4.11.2.2 The Loran navigation signal is a carefully structured sequence of brief radio frequency pulses centered at 100 kiloHertz. The sequence of signal transmissions consists of a pulse group from the Master (M) station followed at precise time intervals by groups from the secondary stations which are designated by the U.S. Coast Guard with the letters V, W, X, Y and Z. All secondary stations radiate pulses in groups of eight, but the Master signal for identification has an additional ninth pulse.

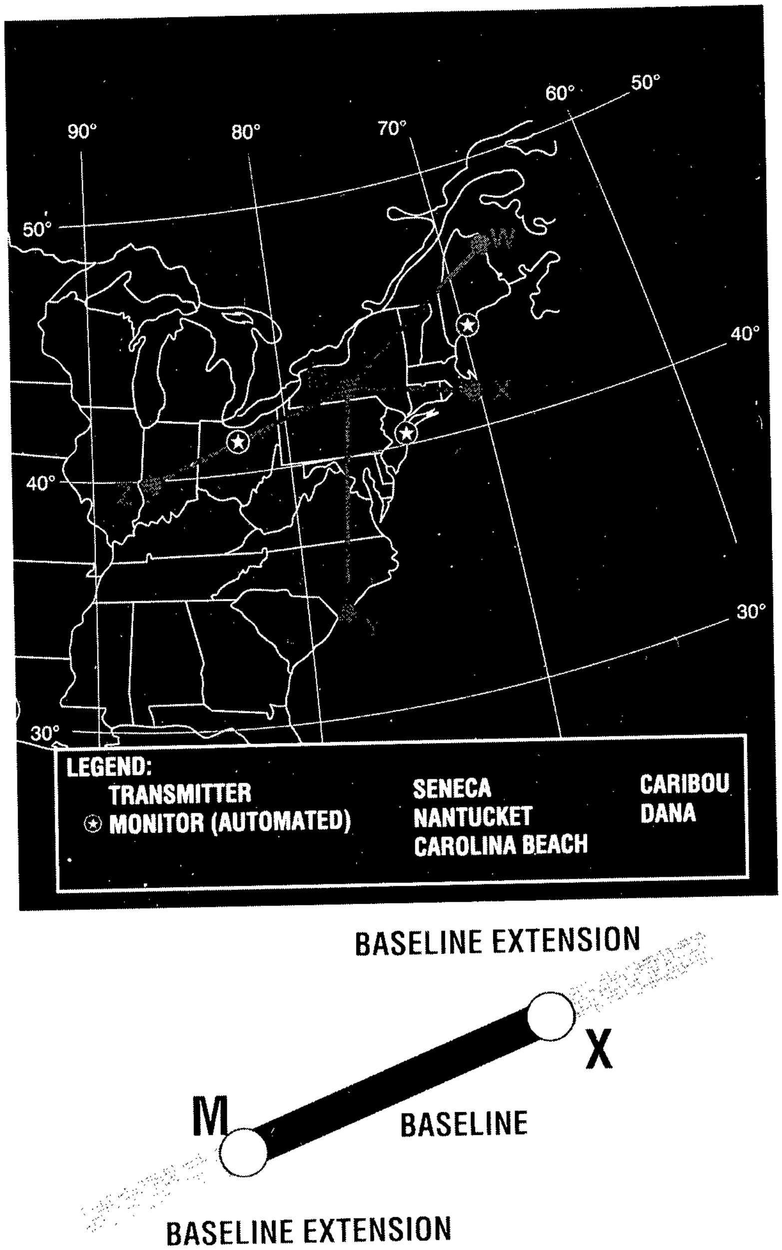


Loran C Pulse

4.11.2.3 The time interval between the reoccurrence of the Master pulse group is the Group Repetition Interval (GRI). The GRI is the same for all stations in a chain and each Loran chain has a unique GRI. Since all stations in a particular chain operate on the same radio frequency, the GRI is the key by which a Loran receiver can identify and isolate signal groups from a specific chain.

Example:

Transmitters in the Northeast U.S. chain operate with a GRI of 99,600 microseconds which is shortened to 9960 for convenience. The Master station (M) at Seneca NY controls: Secondary stations (W) at Caribou, ME; (X) at Nantucket, MA; (Y) at Carolina Beach, NC; and (Z) at Dana, IN. In order to keep chain operations precise, the system uses monitor receivers at Cape Elizabeth, ME, Sandy Hook, NJ and Plumbrook, OH. Monitor receivers continuously measure various aspects of the quality and accuracy of Loran signals and report system status to a control station were chain timing is maintained.



Loran-C Northeast U.S. Chain-GRI 9960

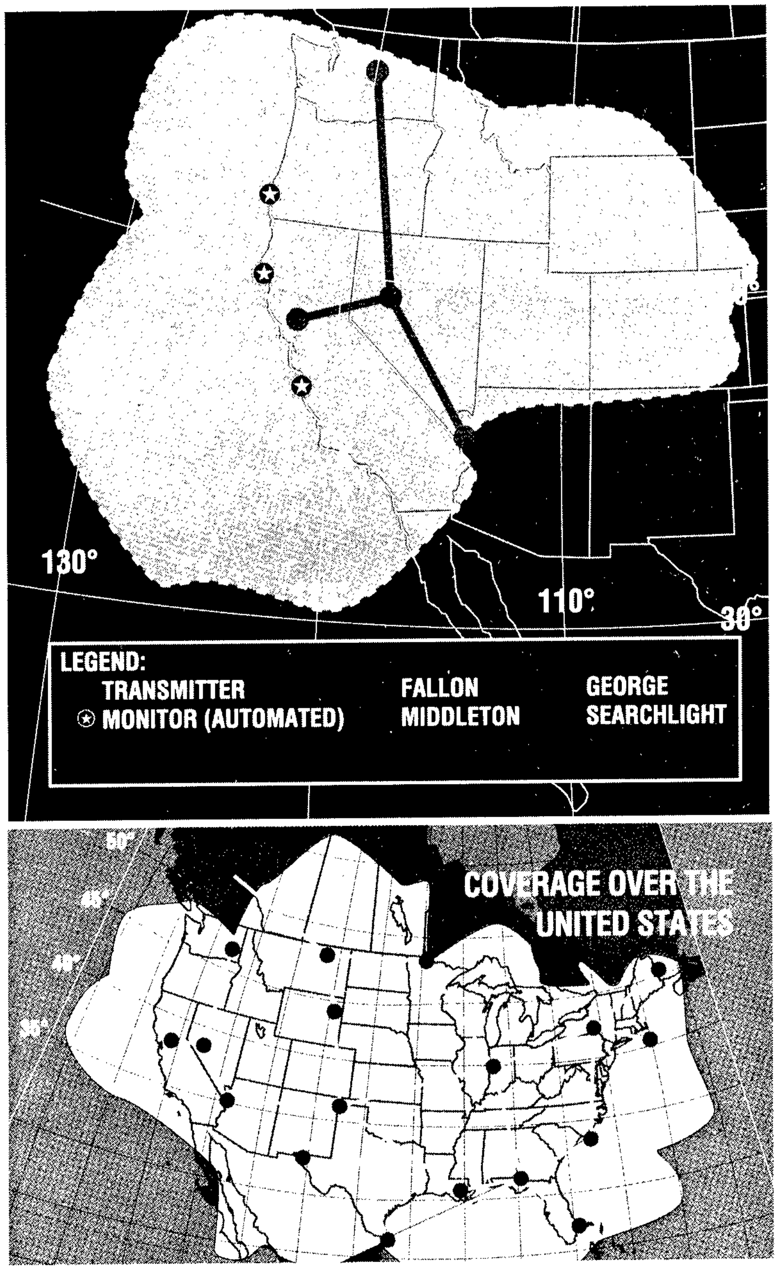
4.11.2.4 The line between the Master and each secondary station is the ''baseline'' for a pair of stations. Typical baselines are from 600 to 1000 nautical miles in length. The continuation of the baseline in either direction is a ''baseline extension''.

4.11.2.5 Loran transmitter stations have time and control equipment, a transmitter, auxiliary power equipment, a building about 100 by 30 feet in size and an antenna that is about 700 feet tall. A station generally requires approximately 100 or more acres of land to accommodate guy lines that keep the antenna in position. Each Loran stations transmits from 400 to 1,600 kilowatts of signal power.

4.11.2.6 The USCG operates 27 stations, comprising eight chains, in the U.S. NAS. Four control stations, which monitor chain performance, have personnel on duty full time. The Canadian east and west coast chains also provide signal coverage over small areas of the NAS.

4.11.2.7 When a control station detects a signal problem that could affect navigation accuracy, an alert signal called ''Blink'' is activated. Blink is a distinctive change in the group of eight pulses that can be recognized automatically by a receiver so the user is notified instantly that the Loran system should not be used for navigation. In addition, other problems can cause signal transmissions from a station to be halted.

4.11.2.8 Each individual Loran chain provides navigation-quality signal coverage over an identified area as shown for the West Coast chain, GRI 9940 The chain Master station is at Fallon, NV and secondary stations are at George, WA; Middletown, CA; and Searchlight, NV. In a signal coverage area the signal strength relative to the normal ambient radio noise must be adequate to assure successful reception.



Loran C West Coast Chain-GRI 5990

4.11.3 THE LORAN RECEIVER

4.11.3.1 Before a Loran receiver can provide navigation information for a pilot, it must successfully receive, or "acquire", signals from three or more stations in a chain. Acquisition involves the time synchronization of the receiver with the chain GRI, identification of the Master station signals from among those checked, identification of secondary station signals, and the proper selection of the point in each signal at which measurements should be made.

4.11.3.2 Signal reception at any site will require a pilot to provide location information such as approximate latitude and longitude, or the GRI to be used, to the receiver. Once activated, most receivers will store present location information for later use.

4.11.3.3 The basic measurements made by Loran receivers are the differences in time-of-arrival between the Master signal and the signals from each of the secondary stations of a chain. Each "time difference" (TD) value is measured to a precision of about 0.1 microseconds. As a rule of thumb, 0.1 microsecond is equal to about 100 feet.

4.11.3.4 An aircraft's Loran receiver must recognize three signal conditions: (1) usable signals, (2) absence of signals, and (3) signal Blink. The most critical phase of flight is during the approach to landing at an airport. During the approach phase the receiver must detect a lost signal, or a signal Blink, within 10 seconds of the occurrence and warn the pilot of the event.

4.11.3.5 Most receivers have various internal tests for estimating the probable accuracy of the current TD values and consequent navigation solutions. Tests may include verification of the timing alignment of the receiver clock with the Loran pulse, or a continuous measurement of the signal-to-noise ratio (SNR). SNR is the relative strength of the Loran signals compared to the local ambient noise level. If any of the tests fail, or if the quantities measured are out of the limits set for reliable navigation, then an alarm will be activated to alert the pilot.

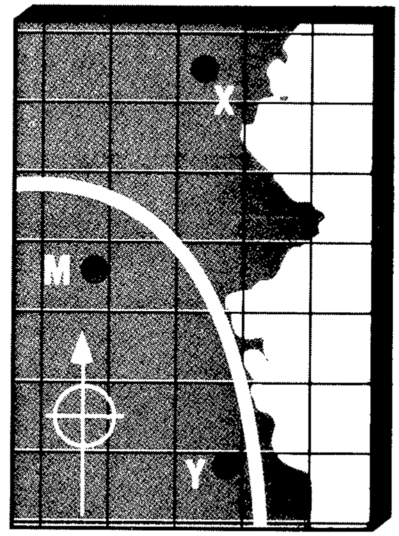
4.11.3.6 Loran signals operate in the low frequency band around (100 kHz) that has been reserved for Loran use. Adjacent to the band, however, are numerous low frequency communications transmitters. Nearby signals can distort the Loran signals and must be eliminated by the receiver to assure proper operation. To eliminate interfering signals, Loran receivers have selective internal filters. These filters, commonly known as "notch filters" reduce the effect of interfering signals.

4.11.3.7 Careful installation of antennas, good metal-to-metal electrical bonding, and provisions for precipitation noise discharge on the aircraft are essential for the successful operation of Loran receivers. A Loran antenna should be installed on an aircraft in accordance with the manufacturer's instructions. Corroded bonding straps should be replaced, and static discharge devices installed at points indicated by the aircraft manufacturer.

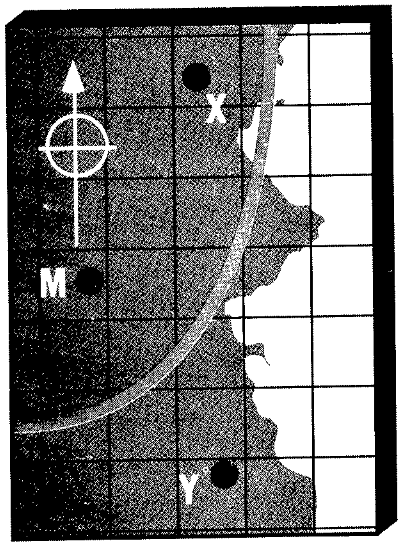
4.11.4 LORAN NAVIGATION

4.11.4.1 An airborne Loran receiver has four major parts: (1) signal processor, (2) navigation computer, (3) control/display, and (4) antenna.

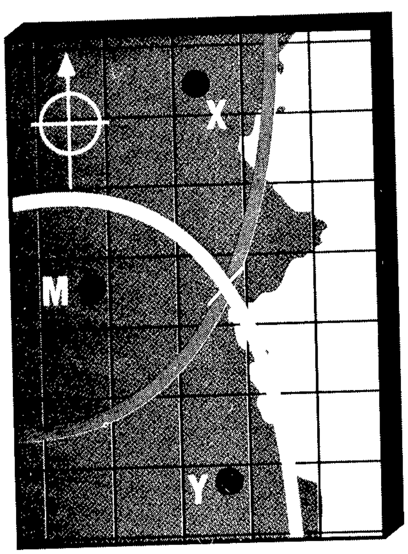
4.11.4.2 The signal processor acquires Loran signals and measures the difference between the time-of-arrival of each secondary station pulse group and the Master station pulse group. The measured TDs depend on the location of the receiver in relation to the three or more transmitters.



4.11.4.2.1 The first TD will locate an aircraft somewhere on a line-of-position (LOP) on which the receiver will measure the same TD value.



4.11.4.2.2 A second LOP is defined by a TD measurement between the Master station signal and the signal form another secondary station.



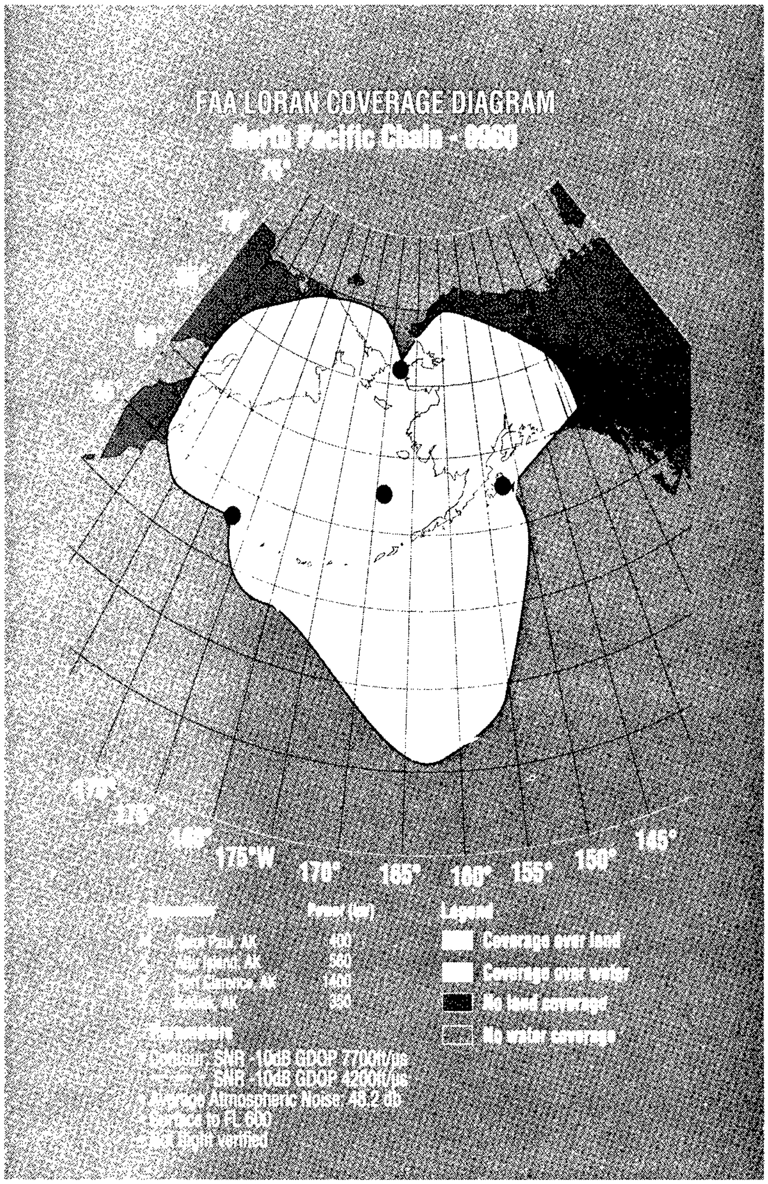
4.11.4.2.3 The intersection of the measured LOPs is the position of the aircraft.

4.11.4.3 The navigation computer converts TD values to corresponding latitude and longitude. Once the time and position of the aircraft is established at two points, distance to destination, cross track error, ground speed, estimated time of arrival, etc., can be determined. Cross track error can be displayed as the vertical needle of a course deviation indicator, or digitally, as decimal parts of a mile left or right of course. During a nonprecision approach, course guidance must be displayed to the pilot with a full scale deviation of +0.30 nautical miles or greater.

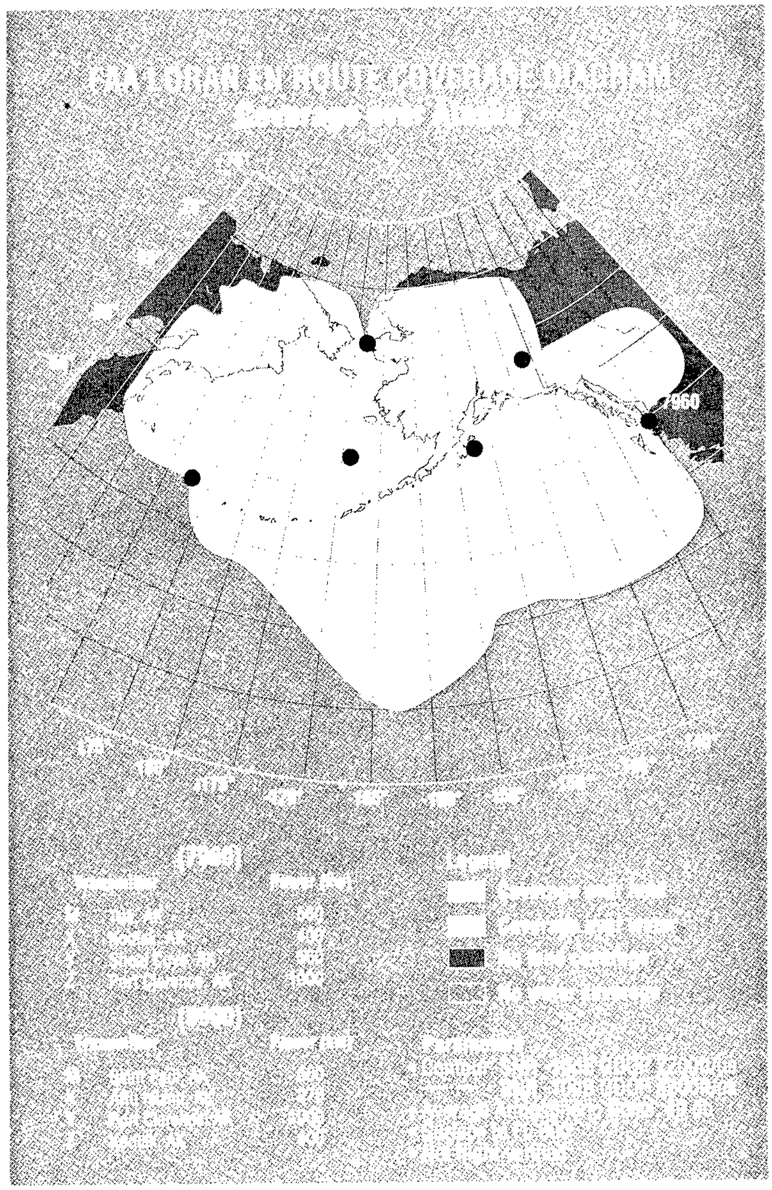
4.11.4.4 Loran navigation for nonprecision approaches requires accurate and reliable information. During an approach the occurrence of signal Blink or loss of signal must be detected within 10 seconds and the pilot must be notified. Loran signal accuracy for approaches is 0.25 nautical miles, well within the required accuracy of 0.30 nautical miles. Loran signal accuracy can be improved by applying the correction values published with approach procedures.

4.11.4.5 Flying a Loran nonprecision approach is different from flying a VOR approach. A VOR approach is on a radial of the VOR station, with guidance sensitivity increasing as the aircraft nears the airport. The Loran system provides a linear grid, so there is constant guidance sensitivity everywhere in the approach procedure. Consequently, inaccuracies and ambiguities that occur during operations in close proximity to VORs (station passage, for example) do not occur in Loran approaches.

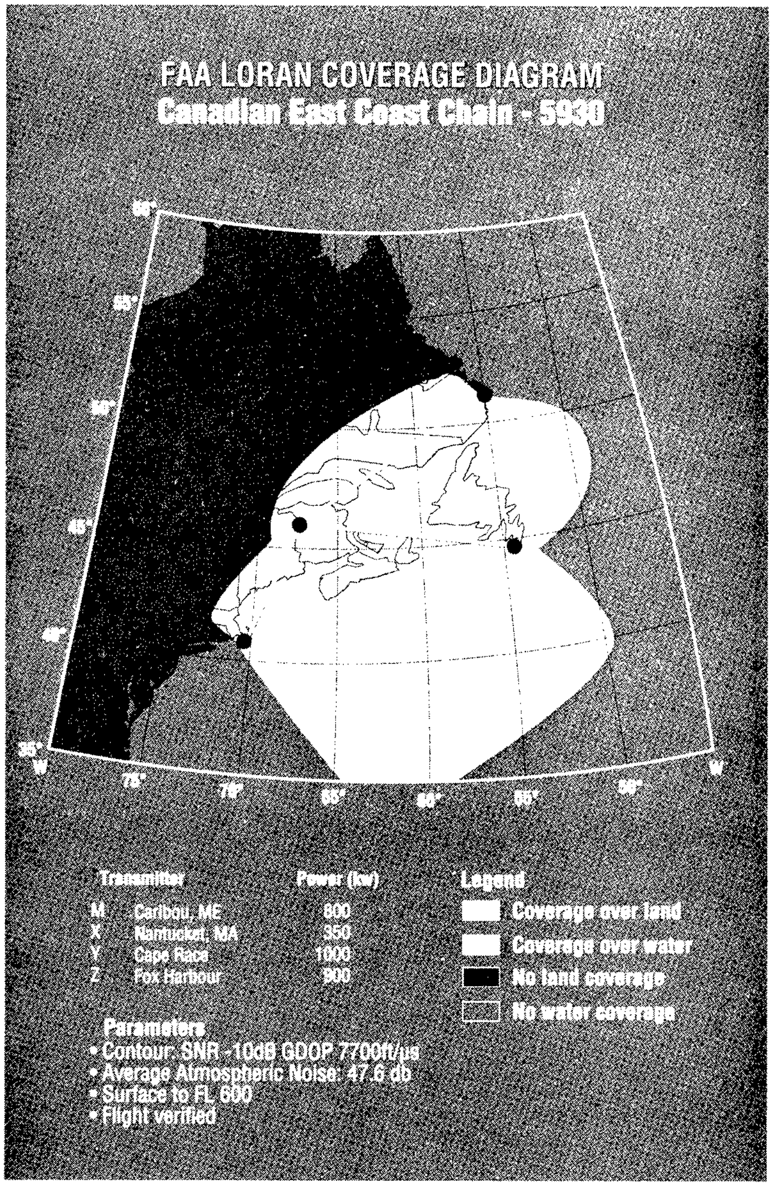
4.11.4.6 The navigation computer also provides storage for data entered by pilot or provided by the receiver manufacturer. The receiver's data base is updated at local maintenance facilities every 60 days to include all changes made by the FAA.



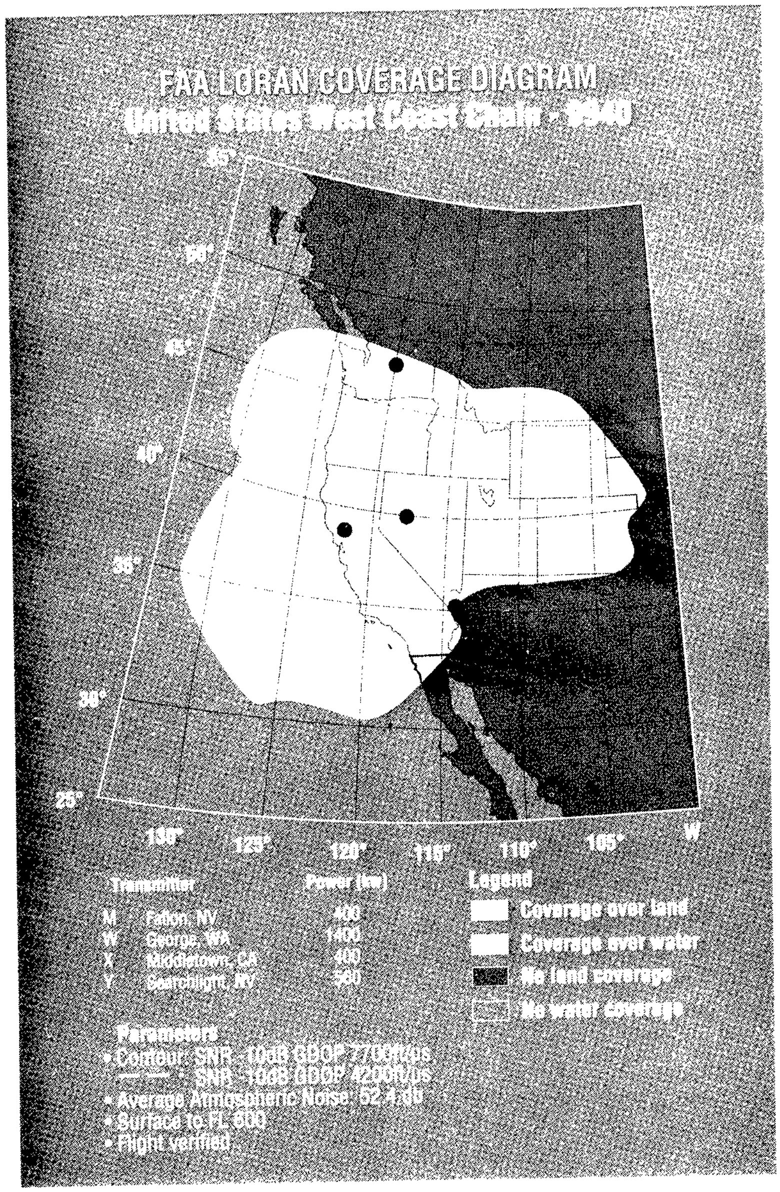
North Pacific Chain-9990



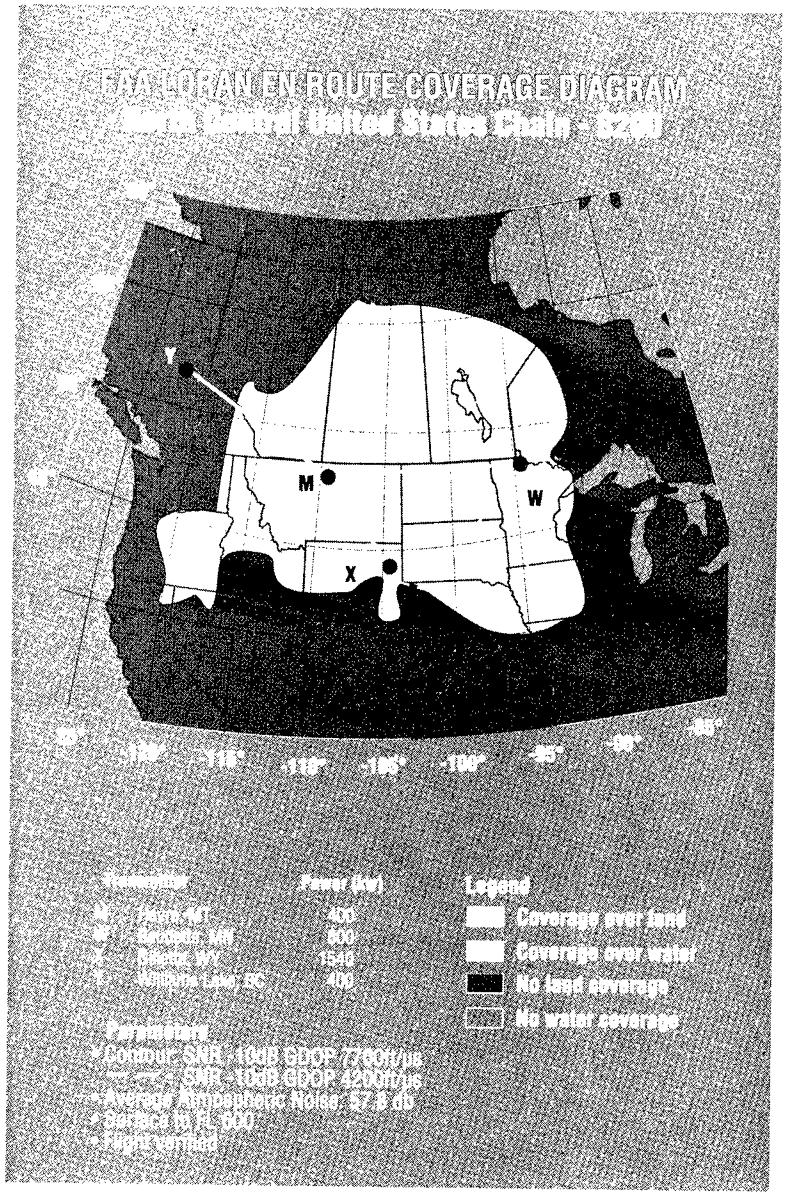
Coverage Over Alaska-7960



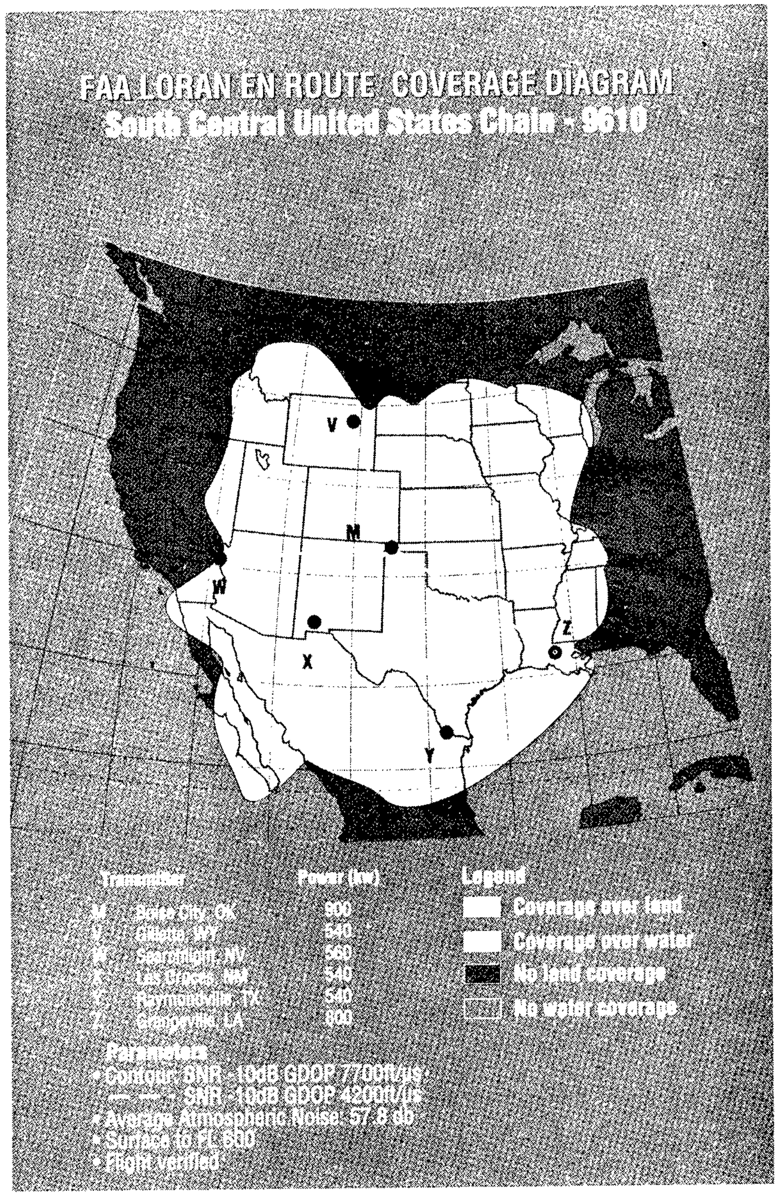
Canadian West Coast Chain-5930



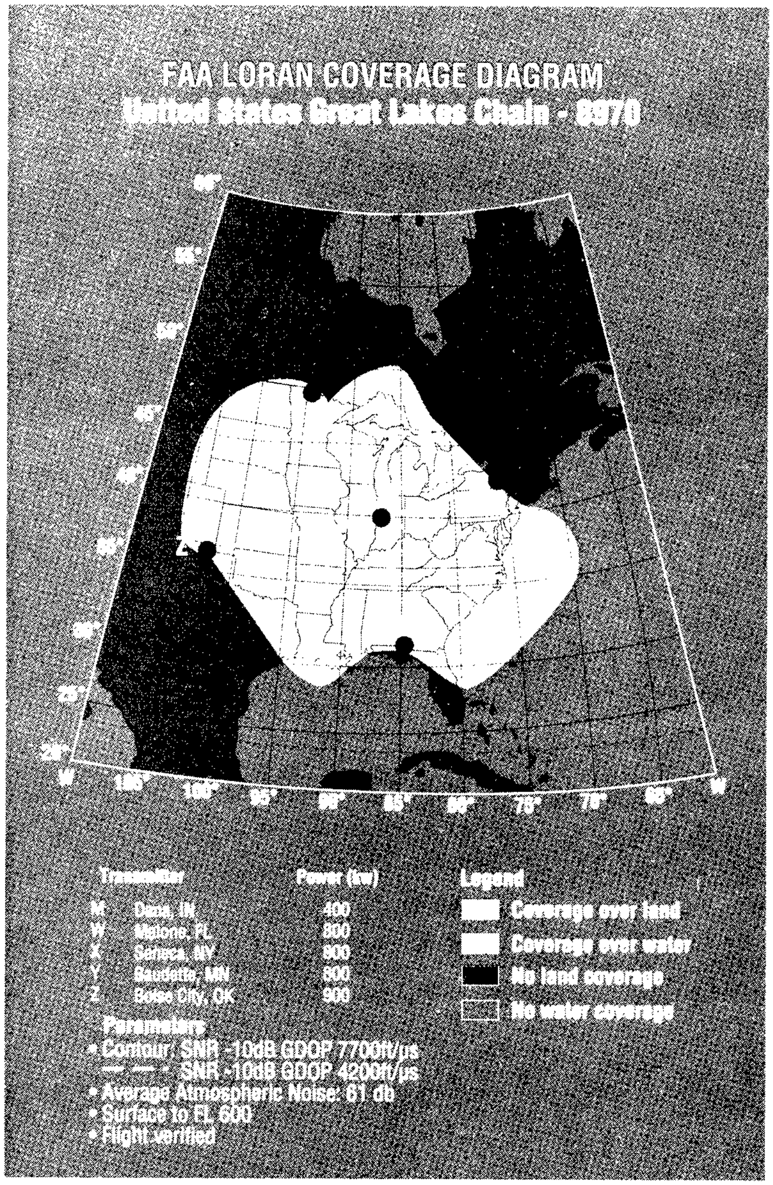
United States West Coast Chain-9940



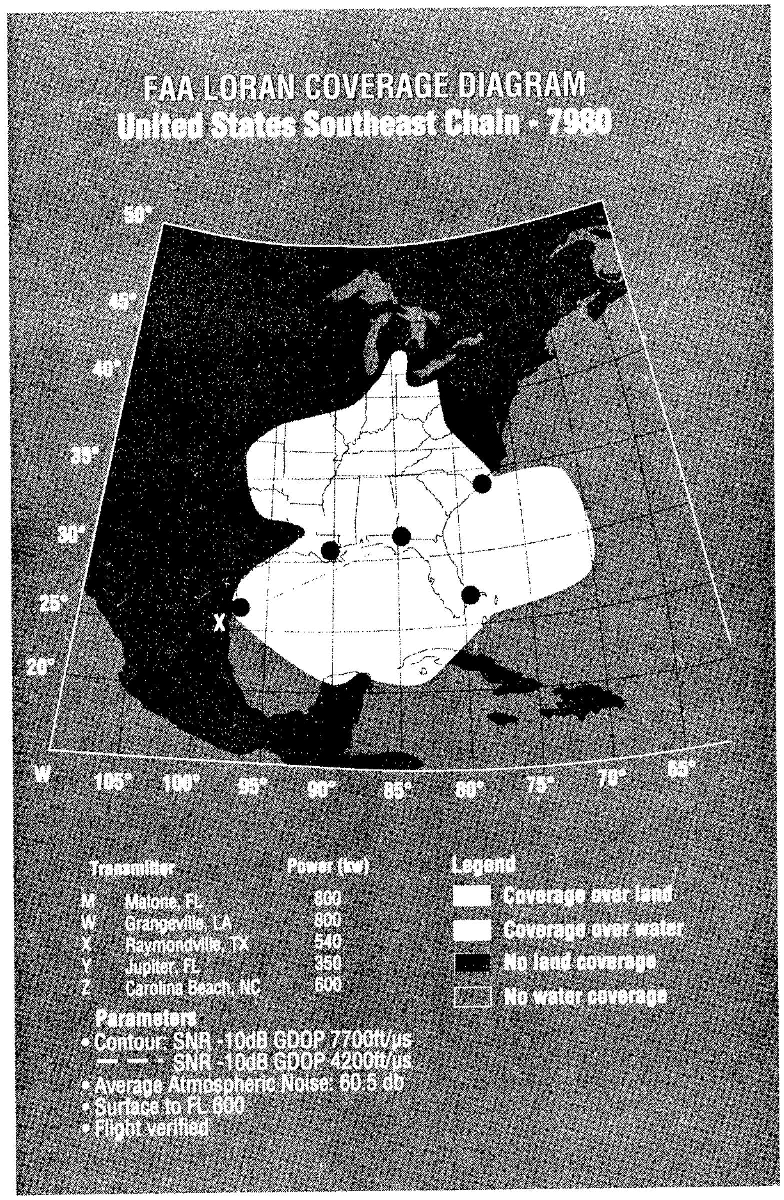
North Central United States Chain-8290



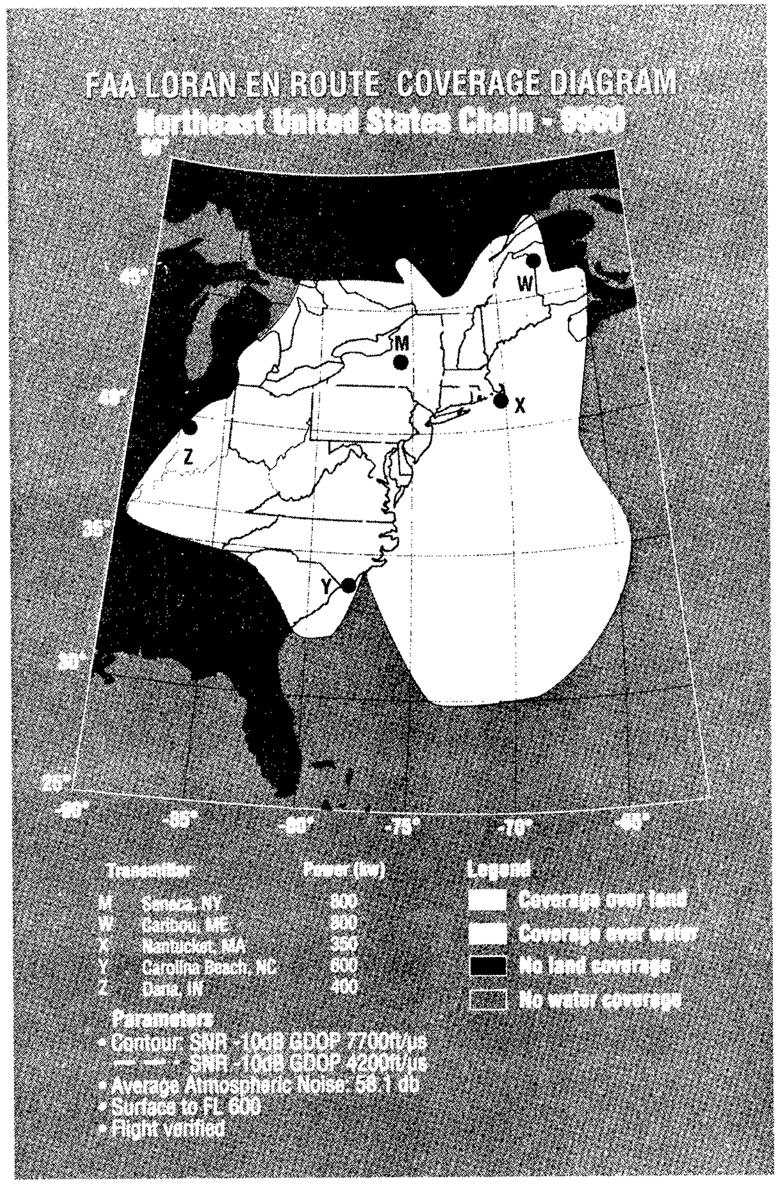
South Central United States Chain-9610



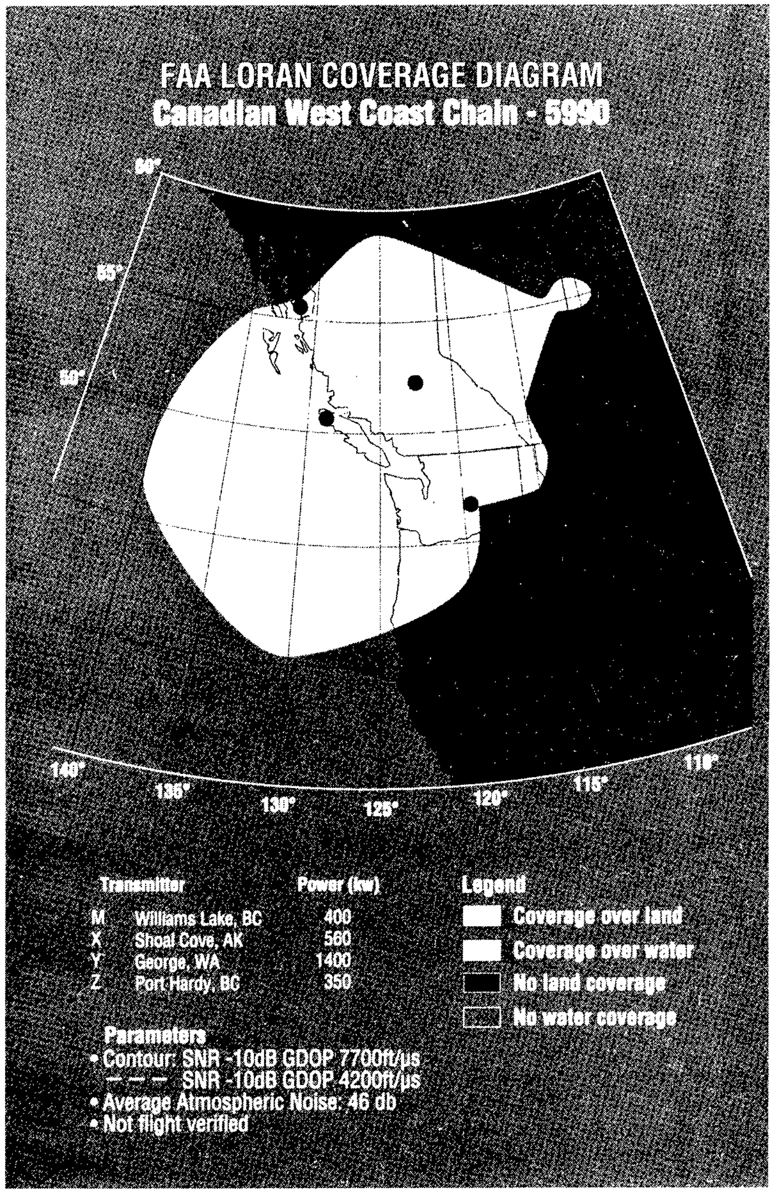
United States Great Lakes Chain-8970



United States Southeast Chain-7980



Northeast United States Chain-9960



Canadian East Coast Chain-5990

4.11.5 Notices to Airman (NOTAMs) are issued for LORAN-C chain or station outages. Domestic NOTAM (D)'s are issued under the identifier "LRN." International NOTAMs are issued under the KNMH series. Pilots may obtain these NOTAMs from Flight Service Station briefers upon request.

4.11.6 LORAN-C status information

Prerecorded telephone answering service messages pertaining to LORAN-C are available as follows:

RATE	CHAIN	TELEPHONE
5930	Canadian East Coast	709-454-3261*
7980	Southeast U.S.	904-569-5241
8970	Great Lakes	607-869-5395
9960	Northeast U.S.	607-869-5395

*St. Anthony, Newfoundland, Canada

Information can also be obtained directly from the office of the Coordinator of Chain Operations (COCO) for each chain. The following telephone numbers are for each COCO office:

RATE	CHAIN	TELEPHONE	LOCATION
4990	Central Pacific	808-247-5591	Kaneohe, HI
5930	Canadian East Coast	709-454-2392	St. Anthony, NF
5990	Canadian West Coast	604-666-0472	Vancouver, BC
7930	North Atlantic	011-44-1-409-4758	London, UK
7960	Gulf of Alaska	907-487-5583	Kodiak, AK
7970	Norwegian Sea	011-44-1-409-4758	London, UK
7980	Southeast U.S.	205-899-5225	Malone, FL
7990	Mediterranean Sea	011-44-1-409-4758	London, UK
8290	North Central U.S.	707-987-2911	Middletown, CA
8970	Great Lakes	607-869-5393	Seneca, NY
9610	South Central U.S.	205-899-5225	Malone, FL
9940	West Coast U.S.	707-987-2911	Middletown, CA
9960	Northeast U.S.	607-869-5393	Seneca, NY
9970	Northwest Pacific	415-437-3224	San Francisco, CA
9990	North Pacific	907-487-5583	Kodiak, AK

4.12 OMEGA and OMEGA/VLF Navigation Systems

4.12.1 *Omega*

4.12.1.1 Omega is a network of eight transmitting stations located throughout the world to provide worldwide signal coverage. These stations transmit in the Very Low Frequency (VLF) band. Because of the low frequency, the signals are receivable to ranges of thousands of miles. The stations are located in Norway, Liberia, Hawaii (USA), North Dakota (USA), La Reunion, Argentina, Australia, and Japan.

4.12.1.2 Presently each station transmits on four basic navigational frequencies: 10.2 kHz, 11.05 kHz, 11.3 kHz, and 13.6 kHz, in sequenced format. This time sequenced format prevents inter-station signal interference. The pattern is arranged so that during each transmission interval only three stations are radiating, each at a different frequency. With eight stations and a silent .2-second interval between each transmission, the entire cycle repeats every 10 seconds.

4.12.1.3 In addition to the four basic navigational frequencies, each station transmits a unique navigation frequency. An Omega station is said to be operating in full format when the station transmits on the basic frequencies plus the unique frequency. Unique frequencies are presently assigned as follows:

Station A Norway	12.1 kHz
Station B Liberia	12.0 kHz
Station C Hawaii	11.8 kHz
Station D North Dakota	13.1 kHz
Station E La Reunion	12.3 kHz
Station F Argentina	12.9 kHz
Station G Australia	13.0 kHz
Station H Japan	12.8 kHz

4.12.1.4 Interruptions in service of Omega navigation facilities are advertised by NOTAM (Class I).

4.12.2 *Omega/VLF*

4.12.2.1 The U.S. Navy operates a communications system in the VLF band. The stations are located worldwide and transmit at powers of 500-1000 kW. Some airborne Omega receivers have the capability to receive and process these VLF signals for navigation in addition to Omega signals. The VLF stations generally used for navigation are located in Australia, Japan, England, Hawaii and on the U.S. mainland in Maine, Washington state, and Maryland.

4.12.2.2 Although the Navy does not object to the use of VLF communications signals for navigation, the system is not dedicated to navigation. Signal format, transmission, and other parameters of the VLF system are subject to change at the Navy's discretion. The VLF communications stations are individually shut down for scheduled maintenance for a few hours each week. Regular NOTAM service regarding the VLF system or station status is not available. However, the Naval Observatory provides a taped message concerning phase differences, phase values, and shutdown information for both the VLF communications network and the Omega system (phone 202-653-1757).

4.12.3 *Operational Use of Omega and Omega/VLF*

4.12.3.1 The Omega navigation network is capable of providing consistent fixing information to an accuracy of +/-2 NM depending upon the level of sophistication of the receiver/processing system. Omega signals are affected by propagation variables which may degrade fix accuracy. These variables include daily variation of phase velocity, polar cap absorption, and sudden solar activity. Daily compensation for variation within the receiver/processor, or occasional excessive solar activity and its effect on Omega cannot be completely forecast or anticipated. If an unusual amount of solar activity disturbs the Omega signal enlargement paths to any extent, the U.S. Coast Guard advises the FAA and an appropriate NOTAM is sent.

4.12.3.2 At 16 minutes past each hour, WWV (Fort Collins, Colorado) broadcasts a message concerning the status of each Omega station, signal irregularities, and other information concerning Omega. At 47 minutes past each hour, WWVH (Hawaii) broadcasts similar information. The U.S. Coast Guard provides a taped Omega status report (phone 703-313-5906). NOTAMs concerning Omega are available through any Flight Service Station. Omega NOTAMs should be requested by Omega station name.

4.12.3.3 The FAA has recognized Omega and Omega/VLF systems as an additional, but not the sole, means of en route IFR navigation in the conterminous United States and Alaska when approved in accordance with FAA guidance information. Use of Omega or Omega/VLF requires that all navigation equipment otherwise required by the Federal Aviation Regulations be installed and operating. When flying RNAV routes, VOR and DME equipment is required.

4.12.3.4 The FAA recognizes the use of the Naval VLF communications system as a supplement to Omega, but not the sole means of navigation.

4.13 Inertial Navigation System (INS)

4.13.1 The Inertial Navigation System is a totally self-contained navigation system, comprised of gyros, accelerometers, and a navigation computer, which provides aircraft position and navigation information in response to signals resulting from inertial effects on system components, and does not require information from external references. INS is aligned with accurate position information prior to departure, and thereafter calculates its position as it progresses to the destination. By programming a series of waypoints, the system will navigate along a predetermined track. New waypoints can be inserted at any time if a revised routing is desired. INS accuracy is very high initially following alignment, and decays with time at the rate of about 1-2 nautical miles per hour. Position update alignment can be accomplished inflight using ground based references, and many INS systems now have sophisticated automatic update using dual DME and or VOR inputs. INS may be approved as the sole means of navigation or may be used in combination with other systems.

4.14 Doppler Radar

4.14.1 Doppler Radar is a semiautomatic self-contained dead reckoning navigation system (radar sensor plus computer) which is not continuously dependent on information derived from ground based or external aids. The system employs radar signals to detect and measure ground speed and drift angle, using the aircraft compass system as its directional reference. Doppler is less accurate than INS or OMEGA however, and the use of an external reference is required for periodic updates if acceptable position accuracy is to be achieved on long range flights.

4.15 Flight Management System (FMS)

4.15.1 The Flight Management System is a computer system that uses a large data base to allow routes to be preprogrammed and fed into the system by means of a data loader. The system is constantly updated with respect to position accuracy by reference to conventional navigation aids. The sophisticated program and its associated data base insures that the most appropriate aids are automatically selected during the information update cycle.

4.16 Global Positioning System (GPS)

4.16.1 The Global Positioning System is a space-base radio positioning, navigation, and time-transfer system being developed by Department of Defense. When fully deployed, the system is intended to provide highly accurate position and velocity information, and precise time, on a continuous global basis, to an unlimited number of properly equipped users. The system will be unaffected by weather, and will provide a worldwide common grid reference system. The GPS concept is predicated upon accurate and continuous knowledge of the spatial position of each satellite in the system with respect to time and distance from a transmitting satellite to the user. The GPS receiver automatically selects appropriate signals from the satellites in view and translates these into a three-dimensional position, velocity, and time. Predictable system accuracy for civil users is projected to be 100 meters horizontally. Performance standards and certification criteria have not yet been established.

5. NAVAID IDENTIFIER REMOVAL DURING MAINTENANCE

5.1 During periods of routine or emergency maintenance, coded identification (or code and voice, where applicable) is removed from certain FAA navaids. Removal of the identification serves as warning to pilots that the facility is officially off the air for tune-up or repair and may be unreliable even though intermittent or constant signals are received.

Note.—During periods of maintenance VHF ranges may radiate a T-E-S-T code (- . ... -).

6. USER REPORTS ON NAVAID PERFORMANCE

6.1 Users of the National Airspace System can render valuable assistance in the early correction of navaid malfunctions by reporting their observation of undesirable performance. Although NAVAID's are monitored by electronic detectors adverse effects of electronic interference, new obstructions or changes in terrain near the NAVAID can exist without detection by the ground monitors. Some of the characteristics of malfunction or deteriorating performance which should be reported are: Erratic course or bearing indications; intermittent, or full, flag alarm; garbled, missing or obviously improper coded identification; poor quality communications reception; or, in the case of frequency interference, an audible hum or tone accompanying radio communications or navaid identification.

6.2 Reporters should identify the NAVAID, location of the aircraft, time of the observation, type of aircraft and describe the condition observed; the type of receivers in use will also be useful information. Reports can be made in any of the following ways:

6.2.1 Immediately, by radio communication to the controlling Air Route Traffic Control Center, Control Tower, or Flight Service Station. This provides the quickest result.

6.2.2 By telephone to the nearest FAA facility.

6.2.3 By FAA Form 8000-7, Safety Improvement Report, a postage-paid card designed for this purpose. These cards may be obtained at FAA Flight Service Stations, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operations.

6.3 In aircraft that have more than one receiver, there are many combinations of possible interference between units. This can cause either erroneous navigation indications or, complete or partial blanking out of the communications. Pilots should be familiar enough with the radio installation of particular airplanes they fly to recognize this type of interference.

7. RADIO COMMUNICATIONS PHRASEOLOGY AND TECHNIQUES

7.1 General

7.1.1 Radio communications are a critical link in the ATC system. The link can be a strong bond between pilot and controller — or it can be broken with surprising speed and disastrous results. Discussion herein provides basic procedures for new pilots and also highlights safe operating concepts for all pilots.

7.1.2 The single, most important thought in pilot-controller communications is understanding. It is essential, therefore, that pilots acknowledge each radio communication with ATC by using the appropriate aircraft call sign. Brevity is important, and contacts should be kept as brief as possible, but the controller must know what you want to do before he can properly carry out his control duties. And you, the pilot, must know exactly what he wants you to do. Since concise phraseology may not always be adequate, use whatever words are necessary to get your message across. Pilots are to maintain vigilance in monitoring air traffic control radio communications frequencies for potential traffic conflicts with their aircraft especially when operating on an active runway and/or when conducting a final approach to landing.

7.1.3 All pilots will find the Pilot/Controller Glossary very helpful in learning what certain words or phrases mean. Good phraseology enhances safety and is the mark of a professional pilot. Jargon, chatter and "CB" slang have no place in ATC communications. The Pilot/Controller Glossary is the same glossary used in the ATC controller's handbook. We recommend that it be studied and reviewed from time to time to sharpen your communication skills.

7.2 Radio Technique

7.2.1 *Listen* before you transmit. Many times you can get the information you want through ATIS or by monitoring the frequency. Except for a few situations where some frequency overlap occurs, if you hear someone else talking, the keying of your transmitter will be futile and you will probably jam their receivers causing them to repeat their call. If you have just changed frequency, pause for your receiver to tune, listen and make sure the frequency is clear.

7.2.2 *Think* before keying your transmitter. Know what you want to say and if it is lengthy, e.g., a flight plan or IFR position report, jot it down. (But do not lock your head in the cockpit.)

7.2.3 The microphone should be very close to your lips and after pressing the mike button, a slight pause may be necessary to be sure the first word is transmitted. Speak in a normal conversational tone.

7.2.4 When you release the button, wait a few seconds before calling again. The controller or FSS specialist may be jotting down your number, looking for your flight plan, transmitting on a different frequency, or selecting his transmitter to your frequency.

7.2.5 Be alert to the sounds or lack of sounds in your receiver. Check your volume, recheck your frequency and make sure that your microphone is not stuck in the transmit position. Frequency blockage can, and has, occurred for extended periods of time due to unintentional transmitter operation. This type of interference is commonly referred to as a "stuck mike," and controllers may refer to it in this manner when attempting to assign an alternate frequency. If the assigned frequency is completely blocked by this type of interference, use the procedures described in RAC-3, En Route IFR, Radio Frequency Outage, to establish/reestablish communications with ATC.

7.2.6 Be sure that you are within the performance range of your radio equipment and the ground station equipment. Remote radio sites do not always transmit and receive on all of a facilities available frequencies, particularly with regard to VOR sites where you can hear but not reach a ground station's receiver. Remember that higher altitude increases the range of VHF "line of sight" communications.

7.3 Use of Aircraft Call Signs.

7.3.1 Improper use of call signs can result in pilots executing a clearance intended for another aircraft. *Call signs should never be abbreviated on an initial contact or at any time when other aircraft call signs have similar numbers/sounds or identical letters/numbers,* (e.g., Cessna 6132F, Cessna 1622F, Baron 123F, Cherokee 7732F, etc.). As an example, assume that a controller issues an approach clearance to an aircraft at the bottom of a holding stack and an aircraft with a similar call sign (at the top of the stack) acknowledges the clearance with the last two or three numbers of his call sign. If the aircraft at the bottom of the stack did not hear the clearance and intervene, flight safety would be affected, and there would be no reason for either the controller or pilot to suspect that anything is wrong. This kind of "human factors" error can strike swiftly and is extremely difficult to rectify. Pilots, therefore, must be certain that aircraft identification is complete and clearly identified before taking action on an ATC clearance. ATC specialists will not abbreviate call signs of air carrier or other civil aircraft having authorized call signs. ATC specialists may initiate abbreviated call signs of other aircraft by using the prefix and the last three digits/letters of the aircraft identification after communications are established. The pilot may use the abbreviated call sign in subsequent contacts with the ATC specialist. When aware of similar/identical call signs, ATC specialists will take action to minimize errors by emphasizing certain numbers/letters, by repeating the entire call sign, repeating the prefix, or by asking pilots to use a different call sign temporarily. Pilots should use the phrase "Verify clearance for (your complete call sign)" if doubt exists concerning proper identity.

7.3.2 **Civil aircraft** pilots should state the aircraft type, model or manufacturer's name followed by the digits/letters of the registration number. When the aircraft manufacturer's name or model is stated, the prefix "N" is dropped.

Examples:

"BONANZA SIX FIVE FIVE GOLF," "DOUGLAS ONE ONE ZERO," "BREEZY SIX ONE THREE ROMEO EXPERIMENTAL" (Omit "Experimental" after initial contact).

7.3.3 **Air Taxi** or other commercial operators not having FAA authorized call signs should prefix their normal identification with the phonetic word "Tango." For example, Tango Aztec Two Four Six Four Alpha.

7.3.4 **Air carriers and commuter air carriers** having FAA authorized call signs should identify themselves by stating the complete call sign, using group form for the numbers.

Examples:

UNITED TWENTY-FIVE, MIDWEST COMMUTER SEVEN ELEVEN.

7.3.5 **Military** aircraft use a variety of systems including serial numbers, word call signs and combinations of letter/numbers. Examples include Army Copter 48931, Air Force 61782, REACH 31792, Pat 157, Air Evac 17652, Navy Golf Alpha Kilo 21, Marine 4 Charlie 36, etc.

7.3.6 **Air Ambulance Flights.** Because of the priority afforded air ambulance flights in the ATC system, extreme discretion is necessary when using the term "LIFEGUARD." It is only intended for those missions of an urgent medical nature and to be utilized only for that portion of the flight requiring expeditious handling. When requested by the pilot, necessary notification to expedite ground handling of patients, etc., is provided by ATC; however, when possible, this information should be passed in advance through non-ATC communications systems.

7.3.6.1 Civilian air ambulance flights responding to medical emergencies (first call to an accident scene, carrying patients, organ donors, organs, or other urgently needed lifesaving medical material) will be expedited by ATC when necessary. When expeditious handling is necessary, add the word "LIFEGUARD" in the remarks section of the flight plan. In radio communications, use the call sign "LIFEGUARD" followed by the aircraft registration letters/numbers.

7.3.6.2. Similar provisions have been made for the use of "Air-Evac" and "Med-Evac" by military air ambulance flights, except that these military flights will receive priority only when specifically requested.

Example:

LIFEGUARD TWO SIX FOUR SIX.

7.3.6.3. Air carrier and air taxi flights responding to medical emergencies will also be expedited by ATC when necessary. The nature of these medical emergency flights usually concerns the transportation of urgently needed lifesaving medical materials or vital organs. IT IS IMPERATIVE THAT THE COMPANY/PILOT DETERMINE, BY THE NATURE/URGENCY OF THE SPECIFIC MEDICAL CARGO, IF PRIORITY ATC ASSISTANCE IS REQUIRED. Pilots shall ensure that the word "LIFEGUARD" is included in the remarks section of the flight plan and use the call sign "LIFEGUARD" followed by the company name and flight number, for all transmissions when expeditious handling is required. It is important for ATC to be aware of "LIFEGUARD" status, and it is the pilot's responsibility to ensure that this information is provided to ATC.

Example:

LIFEGUARD DELTA THIRTY-SEVEN.

7.3.7 **Student Pilots Radio Identification.** The FAA desires to help the student pilot in acquiring sufficient practical experience in the environment in which he will be required to operate. To receive additional assistance while operating in areas of concentrated air traffic, a student pilot need only identify himself as a student pilot during his initial call to an FAA radio facility. For instance, "Dayton Tower, this is Fleetwing 1234, Student Pilot." This special identification will alert FAA air traffic control personnel and enable them to provide the student pilot with such extra assistance and consideration as he may need. This procedure is not mandatory.

7.4 Description of Interchange or Leased Aircraft

7.4.1 Controllers issue traffic information based on familiarity with airline equipment and color/markings. When an air carrier dispatches a flight using another company's equipment and the pilot does not advise the terminal ATC facility, the possible confusion in aircraft identification can compromise safety.

7.4.2 Pilot flying an "interchange" or "leased" aircraft not bearing the colors/markings of the company operating the aircraft should inform the terminal ATC facility on first contact the name of the operating company and trip number, followed by the company name as displayed on the aircraft, and aircraft type.

Example:

Air Cal 311, United (Interchange/Lease), Boeing 727.

7.5 Use of Ground Station Call Signs

Pilots, when calling a ground station, should begin with the name of the facility being called followed by the type of the facility being called, as indicated in the following examples.

Examples are self-explanatory:

Airport Unicom	"Shannon Unicom"
FAA Flight Service Station	"Shannon Radio"
FAA Flight Service Station (En Route Flight Advisory Service (Weather).	"Seattle Flight Watch"
Airport Traffic Control Tower	"Augusta Tower"
Clearance Delivery Position (IFR).	"Dallas Clearance Delivery"
Ground Control Position in Tower.	"Miami Ground"
Radar or Nonradar Approach Control Position.	"Oklahoma City Approach"
Radar Departure Control Position.	"St. Louis Departure"
FAA Air Route Traffic Control Center.	"Washington Center"

7.6 Radio Communications Phraseology

7.6.1 Phonetic Alphabet

The International Civil Aviation Organization (ICAO) phonetic alphabet is used by FAA personnel when communications conditions are such that the information cannot be readily received without their use. Air traffic control facilities may also request pilots to use phonetic letter equivalents when aircraft with similar sounding identifications are receiving communications on the same frequency. Pilots should use the phonetic alphabet when identifying their aircraft during initial contact with air traffic control facilities. Additionally use the phonetic equivalents for single letters and to spell out groups of letters or difficult words during adverse communications conditions.

CHARACTER	MORSE CODE	TELEPHONY	PHONIC (PRONUNCIATION)
A	.-	Alfa	(AL-FAH)
B	-...	Bravo	(BRAH-VOH)
C	-.-.	Charlie	(CHAR-LEE) or (SHAR-LEE)
D	-..	Delta	(DELL-TAH)
E	.	Echo	(ECK-OH)
F	..-.	Foxtrot	(FOKS-TROT)
G	--.	Golf	(GOLF)
H	....	Hotel	(HOH-TEL)
I	..	India	IN-DEE-AH)
J	.---	Juliett	(JEW-LEE-ETT)
K	-.-	Kilo	(KEY-LOH)
L	.-..	Lima	(LEE-MAH)
M	--	Mike	(MIKE)
N	-.	November	(NO-VEM-BER)
O	---	Oscar	(OSS-CAH)
P	.--.	Papa	(PAH-PAH)
Q	--.-	Quebec	(KEH-BECK)
R	.-.	Romeo	(ROW-ME-OH)
S	...	Sierra	(SEE-AIR-RAH)
T	-	Tango	(TANG-GO)
U	..-	Uniform	(YOU-NEE-FORM) or (OO-NEE-FORM)
V	...-	Victor	(VIK-TAH)
W	.--	Whiskey	(WISS-KEY)
X	-..-	Xray	(ECKS-RAY)
Y	-.--	Yankee	(YANG-KEY)
Z	--..	Zulu	(ZOO-LOO)
1	.----	One	(WUN)
2	..---	Two	(TOO)
3	...--	Three	(TREE)
4	....-	Four	(FOW-ER)
5	.....	Five	(FIFE)
6	-....	Six	(SIX)
7	--...	Seven	(SEV-EN)
8	---..	Eight	(AIT)
9	----.	Nine	(NIN-ER)
0	-----	Zero	(ZEE-RO)

7.6.2 *Figures*

7.6.2.1 Figures indicating hundred and thousands in round number, as for ceiling heights, and upper wind levels up to 9900 shall be spoken in accordance with the following:

Examples:

500 .... FIVE HUNDRED
54,500 .... FOUR THOUSAND FIVE HUNDRED

7.6.2.2 Numbers above 9900 shall be spoken by separating the digits preceding the word "thousand."

Examples:

10,000 .... ONE ZERO THOUSAND
13,500 .... ONE THREE THOUSAND FIVE HUNDRED

7.6.2.3 Transmit airway or jet route numbers as follows:

Examples:

V12 .... VICTOR TWELVE
J533 .... J FIVE THIRTY THREE

7.6.2.4 All other numbers shall be transmitted by pronouncing each digit.

Example:

10 .... ONE ZERO

7.6.2.5 When a radio frequency contains a decimal point, the decimal point is spoken as "Point."

Examples:

122.1 .... ONE TWO TWO POINT ONE

(ICAO Procedures require the decimal point be spoken as "DECIMAL" The FAA will honor such usage by military aircraft and all other aircraft required to use ICAO Procedures.)

7.6.3 Altitudes and Flight Levels

7.6.3.1 Up to but not including 18,000' MSL — by stating the separate digits of the thousands, plus the hundreds.

Examples:

12,000 .... ONE TWO THOUSAND
12,500 .... ONE TWO THOUSAND FIVE HUNDRED

7.6.3.2 At and above 18,000' MSL (FL 180) by stating the words "flight level" followed by the separated digits of the flight level.

Example:

190 .... FLIGHT LEVEL ONE NINER ZERO

7.6.4 Directions

The three digits of a magnetic course, bearing, heading or wind direction, should always be magnetic. The word "true" must be added when it applies.

Examples:

(magnetic course) 005 .... ZERO ZERO FIVE
(true course) 050 .... ZERO FIVE ZERO TRUE
(magnetic bearing) 360 .... THREE SIX ZERO
(magnetic heading) 100 .... ONE ZERO ZERO
(wind direction) 220 .... TWO TWO ZERO

7.6.5 Speeds

The separate digits of the speed are to be followed by the word 'knots' except that controllers may omit the word "knots" when using speed adjustment procedures (e.g., "Reduce/Increase Speed To Two Five Zero").

Examples:

250 .... TWO FIVE ZERO KNOTS
190 .... ONE NINER ZERO KNOTS

The separate digits of the mach number are to be preceded by the word "MACH."

Examples:

1.5 .... MACH ONE POINT FIVE
.64 .... MACH POINT SIX FOUR
.7 .... MACH POINT SEVEN

7.6.6 Time

7.6.6.1 FAA uses Coordinated Universal Time (UTC) for all operations. The term "Zulu" is used when ATC procedures require a reference to UTC.

Example:

0920 .... ZERO NINER TWO ZERO ZULU

To Convert From:	To Coordinated Universal Time:
Eastern Standard Time	Add 5 hours*
Central Standard Time	Add 6 hours*
Mountain Standard Time	Add 7 hours*
Pacific Standard Time	Add 8 hours*
Alaska Standard Time	Add 9 hours*
Hawaii Standard Time	Add 10 hours*

*For Daylight Time subtract 1 hour.

7.6.6.2 The 24-hour clock system is used in radiotelephone transmissions. The hour is indicated by the first two figures and the minutes by the last two figures.

Examples:

0000 .... ZERO ZERO ZERO ZERO
0920 .... ZERO NINER TWO ZERO

7.6.6.3 Time may be stated in minutes only (two figures) in radio telephone communications when no misunderstanding is likely to occur.

7.6.6.4 Current time in use at a station is stated in the nearest quarter minute in order that pilots may use this information for time checks. Fractions of a quarter minute or more, but less than eight seconds more, are stated as the preceding quarter minute; fractions of a quarter minute of eight seconds or more are stated as the succeeding quarter minute.

Examples: Time

0929:05 .... TIME, ZERO NINER TWO NINER
0929:10 .... TIME, ZERO NINER TWO NINER AND ONE-QUARTER

7.7 Procedures for Ground Station Contact

7.7.1 Initial Contact.

7.7.1.1 The term "initial contact" or initial call up" means the first radio call you make to a given facility, or the first call to a different controller/FSS specialist within a facility. Use the following format: (a) name of facility being called, (b) your full aircraft identification as filed in the flight plan or as discussed under aircraft call signs, (c) type of message to follow or your request if it is short, and (d) the word "Over", if required.

Examples:

"NEW YORK RADIO, MOONEY THREE ONE ONE ECHO." "COLUMBIA GROUND CONTROL, CESSNA THREE ONE SIX ZERO FOXTROT, IFR MEMPHIS."

Example:

"MIAMI CENTER BARON FIVE SIX THREE HOTEL, REQUEST VFR TRAFFIC ADVISORIES."

7.7.1.2 Many FSSs are equipped with ROCs and can transmit on the same frequency at more than one location. The frequencies available at specific locations are indicated on charts above FSS communications boxes. To enable the specialist to utilize the correct transmitter, advise the location and frequency on which you expect a reply.

Example:

St. Louis FSS can transmit on frequency 122.3 at either Farmington, MO, or Decatur, IL. If you are in the vicinity of Decatur, your callup should be "SAINT LOUIS RADIO, PIPER SIX NINER SIX YANKEE, RECEIVING DECATUR ONE TWO TWO POINT THREE."

7.7.1.3 If radio reception is reasonably assured, inclusion of your request, your position or altitude, the phrase "Have numbers" or "Information Charlie received" (for ATIS) in the initial contact helps decrease radio frequency congestion. Use discretion and do not overload the controller with information he does not need. When you do not get a response from the ground station, recheck your radios or use another transmitter and keep the next contact short.

Example:

"ATLANTA CENTER, DUKE FOUR ONE ROMEO, REQUEST VFR TRAFFIC ADVISORIES, TWENTY NORTHWEST ROME, SEVEN THOUSAND FIVE HUNDRED, OVER."

7.7.2 Initial contact when your transmitting and receiving frequencies are different.

7.7.2.1 If you are attempting to establish contact with a ground station and you are receiving on a different frequency than that transmitted, indicate the VOR name or the frequency on which you expect a reply. Most FSSs and control facilities can transmit on several VOR stations in the area. Use the appropriate FSS call sign as indicated on charts.

Example:

New York FSS transmits on the Kennedy, Deer Park and Calverton VORTACs. If you are in the Calverton area, your callup should be "New York Radio, Cessna Three One Six Zero Foxtrot, Receiving Riverhead VOR, Over."

7.7.2.2 If the chart indicates FSS frequencies above the VORTAC or in FSS communications boxes, transmit or receive on those frequencies nearest your location.

7.7.2.3 When unable to establish contact and you wish to call any ground station, use the phrase "any radio (tower) (station), give Cessna Three One Six Zero Foxtrot a call on (frequency) or (VOR)." If an emergency exists or you need assistance, so state.

7.7.3 Subsequent Contacts and Responses to Call up from a Ground Facility. Use the same format as used for initial contact except you should state your message or request with the call up in one transmission. The ground station name and the word "Over" may be omitted if the message requires an obvious reply and there is no possibility for misunderstandings. You should acknowledge all callups or clearances unless the controller of FSS specialist advises otherwise. There are some occasions when the controller must issue time-critical instructions to other aircraft and he may be in a position to observe your response, either visually or on radar. If the situation demands your response, take appropriate action or immediately advise the facility of any problem. Acknowledge with your aircraft identification and one of the words "Wilco, Roger, Affirmative, Negative" or other appropriate remarks; e.g., "Piper Two One Four Lima, Roger." If you have been receiving services, e.g., VFR traffic advisories and you are leaving the area or changing frequencies, advise the ATC facility and terminate contact.

7.7.4 Acknowledgement of Frequency Changes.

7.7.4.1 When advised by ATC to change frequencies, acknowledge the instruction. If you select the new frequency without an ackowledgement, the controller's workload is increased because he has no way of knowing whether you received the instruction or have had radio communications failure.

7.7.4.2 At times, a controller/specialist may be working a sector with multiple frequency assignments. In order to eliminate unnecessary verbiage and to free the controller/specialist for higher priority transmissions, the controller/specialist may request the pilot "(Identification), change to my frequency 123.4." This phrase should alert the pilot that he is only changing frequencies, not controller/specialist, and that initial call up phraseology may be abbreviated.

EXAMPLE:

"United 222 on 123.4."

7.7.5 Compliance with Frequency Changes. When instructed by ATC to change frequencies, select the new frequency as soon as possible unless instructed to make the change at a specific time, fix, or altitude. A delay in making the change could result in an untimely receipt of important information. If you are instructed to make the frequency change at a specific time, fix, or altitude, monitor the frequency you are on until reaching the specified time, fix, or altitudes unless instructed otherwise by ATC.

8. COMMUNICATIONS FOR VFR FLIGHTS

8.1 FAA Flight Service Stations (FSSs) and Supplemental Weather Service Locations (SWSLs) are allocated frequencies for different functions; for example, 122.0 MHz is assigned as the En Route Flight Advisory Service frequency at selected FSSs. In addition, certain FSSs provide Local Airport Advisory on 123.6 MHz. Frequencies are listed in the Airport/Facility Directory. If you are in doubt as to what frequency to use, 122.2 MHz is assigned to the majority of FSSs as a common en route simplex frequency.

Note.—In order to expedite communications, state the frequency being used and the aircraft location during initial call-up.

Example:

"DAYTON RADIO, THIS IS N12345 ON 122.2 MHz OVER SPRINGFIELD VOR, OVER."

8.1.1 Certain VOR voice channels are being utilized for recorded broadcasts, i.e., ATIS, HIWAS, etc. These services and appropriate frequencies are listed in the Airport/Facility Directory. On VFR flights, pilots are urged to monitor these frequencies. When in contact with a control facility, notify the controller if you plan to leave the frequency to monitor these broadcasts.

8.2 Hazardous Area Reporting Service

8.2.1 Selected Flight Service Stations provide flight monitoring where regularly traveled VFR routes cross large bodies of water, swamps, and mountains, for the purpose of expeditiously alerting Search and Rescue facilities when required.

8.2.1.1 When requesting the service either in person, by telephone or by radio, pilots should ask for the service desired and be prepared to give the following information — type of aircraft, altitude, indicated airspeed, present position, route of flight, heading.

8.2.1.2 Radio contacts are desired at least every 10 minutes. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for service when they are outside the service area boundary. Pilots experiencing two-way radio failure are expected to land as soon as practicable and cancel their request for the service. The illustration in Appendix Two includes the areas and the FSS facilities involved in this program.

8.2.2 Long Island Sound Reporting Service (LIRS)

The New York and Bridgeport AFSSs provide Long Island Sound Reporting service on request for aircraft traversing Long Island Sound.

8.2.2.1 When requesting the service pilots should ask for SOUND REPORTING SERVICE and should be prepared to provide the following appropriate information: (1) Type and color of aircraft, (2) The specific route and altitude across the sound including the shore crossing point, (3) The overwater crossing time, (4) Number of persons on board, (5) True air speed.

8.2.2.2 Radio contacts are desired at least every 10 minutes, however, for flights of shorter duration a midsound report is requested. If contact is lost for more than 15 minutes, Search and Rescue will be alerted. Pilots are responsible for cancelling their request for the Long Island Sound Reporting Service when outside the service area boundary. Aircraft as soon as practicable and cancel their request for the service.

8.2.2.3 COMMUNICATIONS: Primary communications — pilot transmits 122.1 MHz and listens on the VOR frequency.

NEW YORK AFSS

Hampton RCO	T122.6/R122.6 MHz
Calverton VORTAC	T117.2 MHz
Kennedy VORTAC	T115.9/R122.1 MHz

BRIDGEPORT AFSS

Madison VORTAC	T110.4/R122.1 MHz
Groton VOR	T111.8/R122.1 MHz
Bridgeport VOR	T108.8/R122.1 MHz

8.2.3 Block Island Reporting Service (BIRS)

Within the Long Island Reporting Service, the New York FSS/IFSS also provides an additional service for aircraft operating between Montauk Point and Block Island. When requesting this service, pilots should ask for BLOCK ISLAND REPORTING SERVICE and should be prepared to provide the same flight information as that required for the Long Island Sound Reporting Service.

8.2.3.1 A minimum of three position reports are mandatory for this service. These are:

1. Report leaving Montauk Point or Block Island.
2. Midway report.
3. Report when over Montauk Point or Block Island at which time the pilot cancels the overwater service.

8.2.3.2 COMMUNICATIONS: Pilots are to transmit and receive on 122.6 MHz.

8.2.3.3 Pilots are advised that 122.6 MHz is a remote receiver located at the Hampton VORTAC site and designed to provide radio coverage between Hampton and Block Island. Flights proceeding beyond Block Island may contact the Bridgeport AFSS by transmitting on 122.1 MHz and listing on Groton VOR (TMU) frequency 111.8 MHz.

8.2.4 Cape Cod and Islands Radar Overwater Flight Following

In addition to normal VFR radar advisory service, traffic permitting, Otis Approach Control provides a radar overwater flight following service for aircraft traversing the Cape Code and adjacent Island area. Pilots desiring this service may contact Cape RAPCON on 118.2 MHz

8.2.4.1 Pilots requesting this service should be prepared to give the following information: (1) type and color of aircraft, (2) altitude, (3) position and heading, (4) route of flight, and (5) true airspeed.

8.2.4.2 For best radar coverage pilots are encouraged to fly at 1,500 feet MSL or above.

8.2.4.3 Pilots are responsible for cancelling their request for overwater flight following when they are over the mainland and/or outside the service area boundary.

9. OVER-WATER FLIGHTS RADIO PROCEDURE

9.1 Pilots should remember that there is a need to continuously guard the VHF emergency frequency 121.5 MHz when on long over-water flights, except when communications on other VHF channels, equipment limitations, or cockpit duties prevent simultaneous guarding of two channels. Guarding of 121.5 MHz is particularly critical when operating in proximity to flight information region (FIR) boundaries, for example, operations on Route R220 between Anchorage and Tokyo, since it serves to facilitate communications with regard to aircraft which may experience in-flight emergencies, communications, or navigational difficulties. (Reference ICAO Annex 10, Vol II Paras 5.2.2.1.1.1 and 5.2.2.1.1.2.)

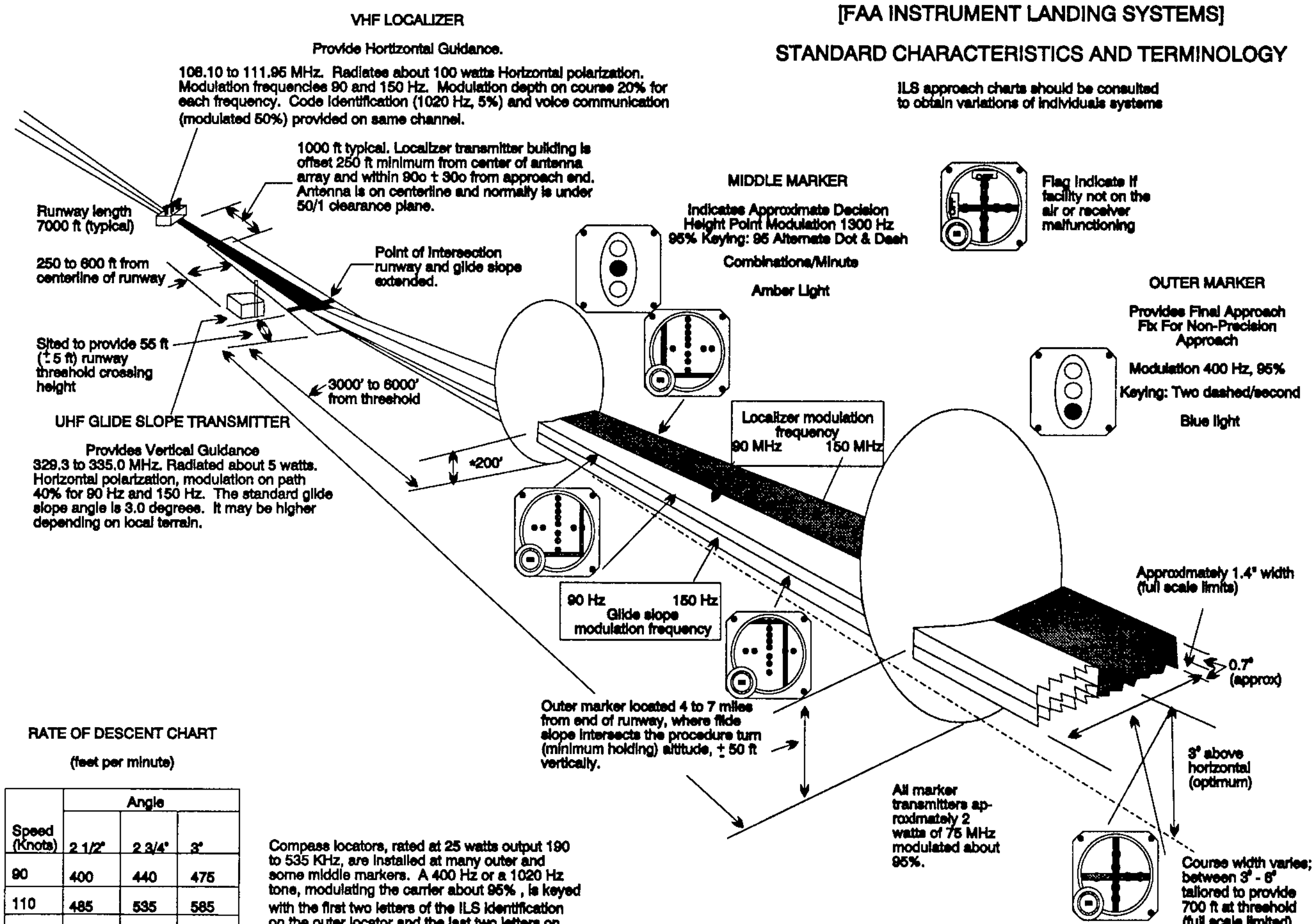
APPENDIX ONE

ILS

[FAA INSTRUMENT LANDING SYSTEMS]

STANDARD CHARACTERISTICS AND TERMINOLOGY

ILS approach charts should be consulted to obtain variations of individuals systems



RATE OF DESCENT CHART

(feet per minute)

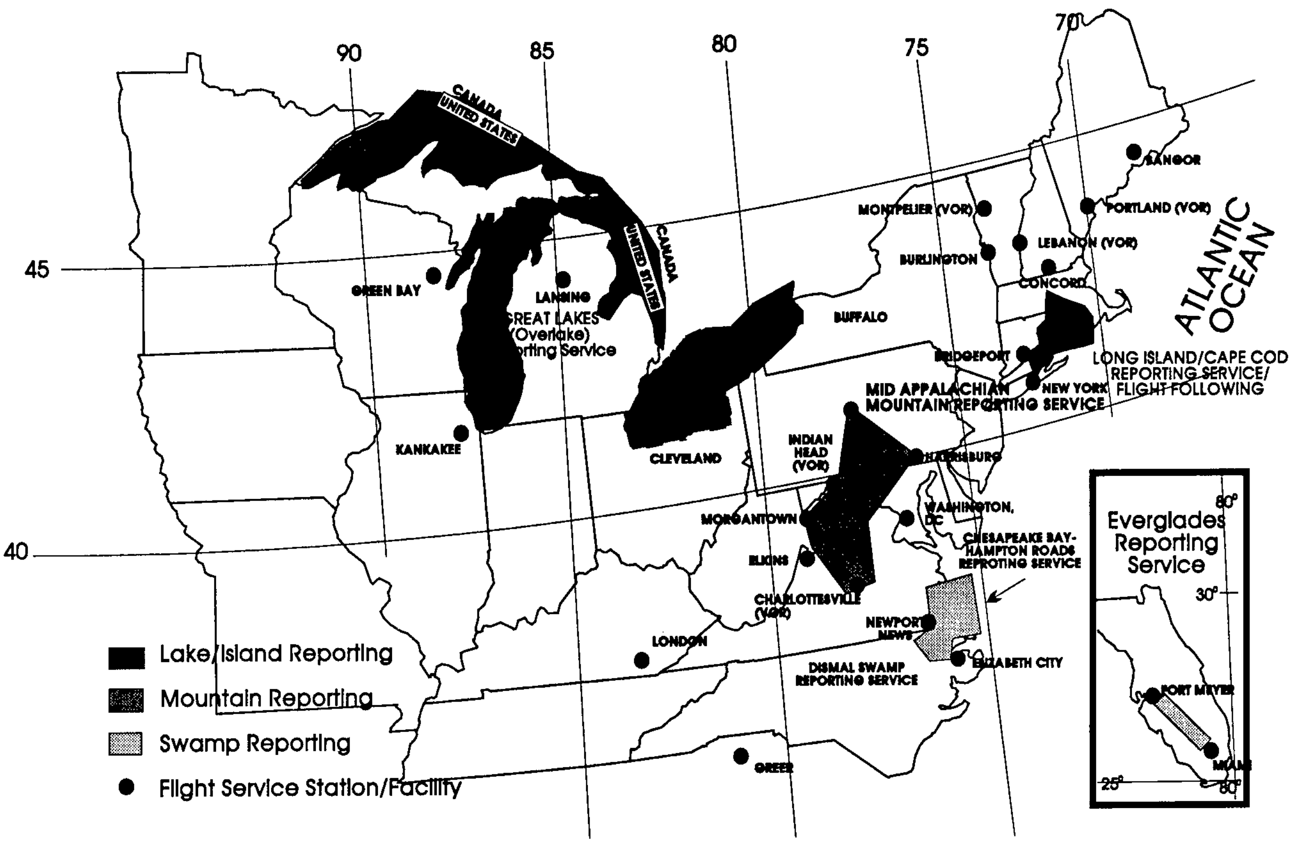
Speed (Knots)	Angle 2 1/2°	2 3/4°	3°
90	400	440	475
110	485	535	585
130	575	630	690
150	665	730	795
160	707	778	849

Compass locators, rated at 25 watts output 190 to 535 KHz, are installed at many outer and some middle markers. A 400 Hz or a 1020 Hz tone, modulating the carrier about 95% , is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. At some locations, simultaneous voice transmissions from the control tower are provided, with appropriate reduction in identification percentage.

* Figures marked with asterisk are typical. Actual figures vary with deviations in distances to markders, glide angles and localizer widths.

APPENDIX TWO

HAZARDOUS AREA REPORTING SERVICE



APPENDIX THREE

Table 1. MLS Channeling

(Azimuth, Elevation, & Data)

CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)
500	5031.0	540	5043.0	580	5055.0	620	5067.0	660	5079.0
501	5031.3	-	-	-	-	-	-	-	-
502	5031.6	-	-	-	-	-	-	-	-
503	5031.9	-	-	-	-	-	-	-	-
504	5032.2	-	-	-	-	-	-	-	-
505	5032.5	545	5044.5	585	5056.5	625	5068.5	665	5080.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
510	5034.0	550	5046.0	590	5058.0	630	5070.0	670	5982.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
515	5035.5	555	5047.5	595	5059.5	635	5071.5	675	5083.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
520	5037.0	560	5049.0	600	5061.0	640	5073.0	680	5085.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
525	5038.5	565	5050.5	605	5062.5	645	5074.5	685	5086.5
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
530	5040.0	570	5052.0	610	5064.0	650	5076.0	690	5088.0
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
535	5041.5	575	5053.5	615	5065.5	655	5077.5	695	5089.5
-	-	-	-	-	-	-	-	696	5089.8
-	-	-	-	-	-	-	-	697	5090.1
-	-	-	-	-	-	-	-	698	5090.4
-	-	-	-	-	-	-	-	699	5090.7

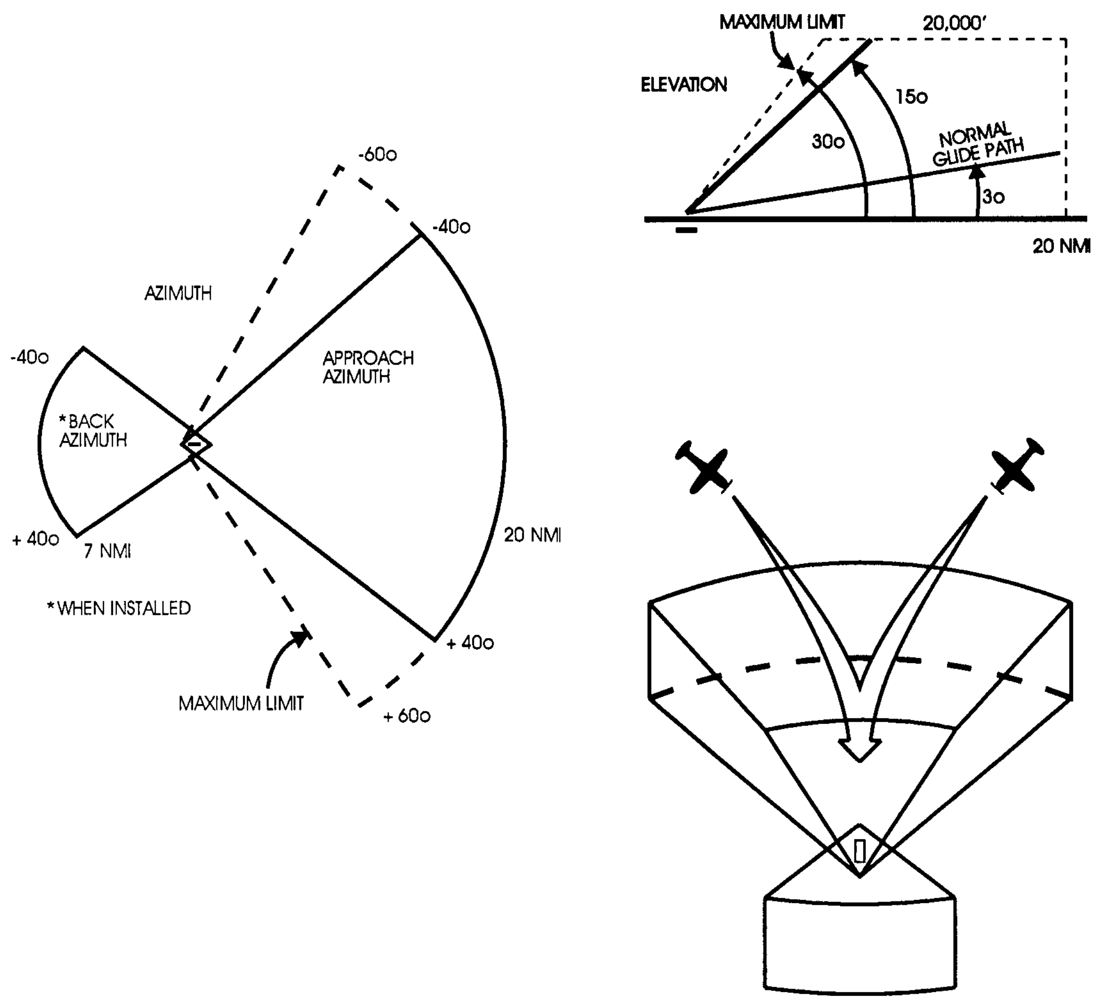
APPENDIX FOUR

Table 2. DME/P Channels, Frequencies, and Pairings

DME CHANNEL (NUMBER)	VHF CHANNEL (MHz)	C-BAND CHANNEL (MHz)	ANGLE CHANNEL (NUMBER)	INTERROGATOR FREQUENCY (MHz)	NON-PRECISION INTERROGATOR PULSE CODE (USEC)	PRECISION INTERROGATOR PULSE CODE (USEC)	TRANSPONDER FREQUENCY (MHz)	TRANSPONDER PULSE CODE (USEC)
1X	...	...	...	1025	12	...	962	12
1Y	...	...	...	1025	36	...	1088	30
2X	...	...	...	1026	12	...	963	12
2Y	...	...	...	1026	36	...	1089	30
3X	...	...	...	1027	12	...	964	12
3Y	...	...	...	1027	36	...	1090	30
4X	...	...	...	1028	12	...	965	12
4Y	...	...	...	1028	36	...	1091	30
5X	...	...	...	1029	12	...	966	12
5Y	...	...	...	1029	36	...	1092	30
6X	...	...	...	1030	12	...	967	12
6Y	...	...	...	1030	36	...	1093	30
7X	...	...	...	1031	12	...	968	12
7Y	...	...	...	1031	36	...	1094	30
8X	...	...	...	1032	12	...	969	12
8Y	...	...	...	1032	36	...	1095	30
9X	...	...	...	1033	12	...	970	12
9Y	...	...	...	1033	36	...	1096	30
10X	...	...	...	1034	12	...	971	12
10Y	...	...	...	1034	36	...	1097	30
11X	...	...	...	1035	12	...	972	12
11Y	...	...	...	1035	36	...	1098	30
12X	...	...	...	1036	12	...	973	12
12Y	...	...	...	1036	36	...	1099	30
13X	...	...	...	1037	12	...	974	12
13Y	...	...	...	1037	36	...	1100	30
14X	...	...	...	1038	12	...	975	12
14Y	...	...	...	1038	36	...	1101	30
15X	...	...	...	1039	12	...	976	12
15Y	...	...	...	1039	36	...	1102	30
16X	...	...	...	1040	12	...	977	12
16Y	...	...	...	1040	36	...	1103	30
17X	108.00	—	—	1041	12	—	978	12
17Y	108.05	5043.00	540	1041	36	42	1104	30
17Z	—	5043.30	541	1041	21	27	1104	15
18X	108.10	5031.00	500	1042	12	18	979	12
18W	—	5031.30	501	1042	24	33	979	24
18Y	108.15	5043.60	542	1042	36	42	1105	30
18Z	—	5043.90	543	1042	21	27	1105	15
19X	108.20	—	—	1043	12	—	980	12

APPENDIX FIVE

COVERAGE VOLUMES



METEOROLOGY (MET)

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METEOROLOGICAL SERVICES

1. METEOROLOGICAL AUTHORITY

1.1 The meteorological services for civil aviation are prepared by the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

Postal Address:
National Weather Service
National Oceanic and Atmospheric Administration
Department of Commerce
8060 13th Street
Silver Spring, Maryland 20910
Telephone: 301-581-1818
Telex: None.
Commercial Telegraphic Address:
METEO WASHINGTON DC

2. APPLICABLE ICAO DOCUMENTS

2.1 ICAO Standards, Recommended Practices and Procedures Contained in the following documents are applied, with the exceptions (differences) noted below:

Annex 3, Meteorology
Doc 7030, Regional Supplementary Procedures (MET Procedures for CAR, NAT, PAC, and NAM)

2.2 Differences from ICAO Standards, Recommended Practices and Procedures. See AIP Section DIF.

3. CLIMATOLOGICAL SUMMARIES

3.1 Climatological summaries are available for the meteorological stations marked with an asterisk in MET-1.

3.2 Requests for copies of climatological summaries are made available through the:

National Climatic Data Center
Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data Services Branch
Federal Building
Asheville, North Carolina 28801

4. AREA OF RESPONSIBILITY

4.1 The National Weather Service is responsible for providing meteorological services for the 50 States of the U.S., its external territories, and possessions.

5. TYPES OF SERVICE PROVIDED

5.1 Area Forecast Charts (Facsimile Form)

5.1.1 The U.S. has one Area Forecast Center, the National Meteorological Center (NMC), located in Suitland, Maryland. The NMC prepares current weather, significant weather, forecast weather, constant pressure, and tropopause-vertical wind shear facsimile charts for the U.S., the Caribbean and Northern South America, the North Atlantic, and the North Pacific areas. The NMC does not prepare facsimile charts for Canada, with the exception of the preparation of a constant pressure and tropopause-vertical wind shear facsimile chart. Weather facsimile charts for Canada are prepared by the Atmospheric Environmental Service located in Montreal, Canada.

5.1.2 Facsimile weather charts are issued throughout the day on a regularly scheduled basis. The charts are transmitted via facsimile to all National Weather Service Offices and to FAA Flight Service Stations providing preflight information to Civil Aviation.

5.2 Local and Regional Aviation Forecasts (printed form)

5.2.1 Numerous forecasts and weather advisories are prepared which serve local and regional areas of the U.S. These forecasts are generally prepared by the National Weather Service on a scheduled basis or, as in the case of severe weather advisories, as needed. These forecasts are Area Forecast (FA), Aviation Terminal Forecast (FT), Severe Weather Forecast (WW), Hurricane Advisories (WT), Winds and Temperature Aloft Forecast (FD), Simplified Surface Analyses (AS), 12- and 24-Hour Prognoses (FS), and flight advisory notices, such as SIGMET's (WS), AIRMET's (WA), Center Weather Advisories (CWA), and Radar Weather Reports (SD).

5.3 Preflight Briefing Services

5.3.1 Preflight briefing services and flight documentation is provided through the preflight information offices operated by the National Weather Service or by the FAA Flight Service Station (FSS).

5.3.2 National Weather Service Preflight Briefing

5.3.2.1 It is the responsibility of the pilot-in-command to notify the National Weather Service preflight information office of his service needs. Details of the documents supplied to each flight are determined by consultation between the briefing officer and the pilot-in-command. In principle, this is determined by the type of aircraft along the following lines:

Piston	—500 and/or 700 mb. Prognostic —Significant Weather Prognostic (surface to 400 mb.) —Terminal Forecasts
Turbo-prop	—500, 300, and/or 250 mb. Prognostic —Significant Weather Prognostic (surface to 400 mb.)
Subsonic	—300, 200, and/or 250 mb. Prognostic jet —Tropopause-Vertical Wind Shear Prognostic —Significant Weather Prognostic (400 mb. to 150 or 70 mb.) —Terminal Forecasts
Long range	—Same as Subsonic Jet plus a 100 mb. Prognostic
Supersonic	—Same as Subsonic Jet plus a 100 mb. Prognostic

5.3.2.2 Aerodrome reports and other local meteorological data are presented in tabular form as indicated in MET 2 and MET 3 and as they are available.

5.4 National Weather Service Aviation Products

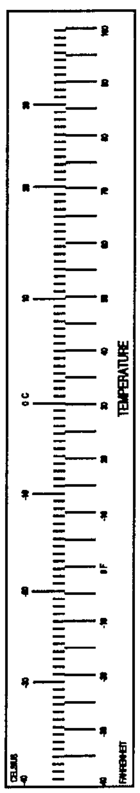
5.4.1 Weather service to aviation is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), the military weather services, and other aviation oriented groups and individuals. The NWS maintains an extensive surface, upper air, and radar weather observing program; a nationwide aviation weather forecasting service; and also provides pilot briefing service. The majority of pilot weather briefings are provided by FAA personnel at Flight Service Stations (FSS). Surface weather observations are taken by the NWS and NWS certified FAA, contract, and supplemental observers and by automated observing systems. (See paragraph MET-0;5.13).

5.4.2 Aviation forecasts are prepared by 52 Weather Service Forecast Offices (WSFO's). These offices prepare and distribute approximately 500 terminal forecasts 3 times daily for specific airports in the 50 States and the Caribbean (4 times daily in Alaska and Hawaii). These forecasts, which are amended as required, are valid for 24 hours. The last 6 hours are given in categorical outlook terms as described in paragraph 5.9. WSFO's also prepare a total of over 300 route forecasts and 39 synopses for Pilots Automatic Telephone Weather Answering Service (PATWAS), Transcribed Weather Broadcasts (TWEB), and briefing purposes. The route forecasts that are issued during the morning and mid-day are valid for 12 hours while the evening issuance is valid for 18 hours. A centralized aviation forecast program originating from the National Aviation Weather Advisory Unit (NAWAU) in Kansas City was implemented in November 1982. In the conterminous U.S., all In-flight Advisories (SIGMET's, convective SIGMET's, and AIRMET's) and all Area Forecasts (6 areas) are now issued by NAWAU. The Area Forecasts are prepared 3 times a day in the conterminous States (4 times in Hawaii), and amended as required, while In-flight Advisories are issued only when conditions warrant. See paragraph 5.8. Winds aloft forecasts are provided for 176 locations in the 48 contiguous States and 21 in Alaska for flight planning purposes. (Winds aloft forecasts for Hawaii are prepared locally.) All the aviation weather forecasts are given wide distribution through the Weather Message Switching Center in Kansas City (WMSC).

5.4.3 Weather element values may be expressed by using different measurement systems depending on several factors, such as whether the weather products will be used by the general public, aviation interests, international services, or a combination of these users. Graphic 5.4.3 provides conversion tables for the most used weather elements that will be encountered by pilots.

5.5 FAA Weather Services

5.5.1 The FAA maintains a nationwide network of Flight Service Stations (FSSs) and Supplemental Weather Service Locations (SWSLs) to serve the weather needs of pilots. In addition, National Weather Service (NWS) meteorologists are assigned to most Air Route Traffic Control Centers (ARTCCs) as part the Center Weather Service Unit (CWSU). They provide advisory service and short-term forecasts (nowcasts) to support the needs of the FAA and other users of the system.



TIME

STANDARD TO UTC

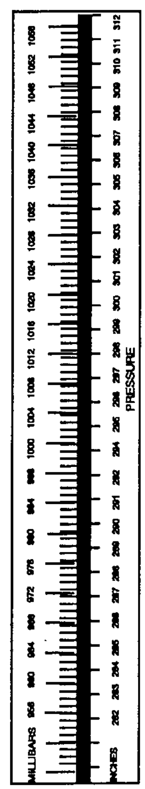
Eastern	+5 hr = UTC
Central	+6 hr = UTC
Mountain	+7 hr = UTC
Pacific	+8 hr = UTC
Alaskan	+9 hr = UTC
Bering	+10 hr = UTC

Add one less hour for Daylight Time

WINDSPEED

MPH	KNOTS
1-2	1-2
3-8	3-7
9-14	8-12
15-20	13-17
21-25	18-22
26-31	23-27
32-37	28-32
38-43	33-37
44-49	38-42
50-54	43-47
55-60	48-52
61-66	53-57
67-71	58-62
72-77	63-67
78-83	68-72
84-89	73-77
119-123	103-107

Knots x 1.15 = Miles Per Hour
Miles Per Hour x 0.869 = Knots



Graphic 5.4.3

RULES OF THE AIR AND AIR TRAFFIC SERVICES (RAC)

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PREFLIGHT PREPARATION AND FLIGHT PLAN REQUIREMENTS

1. PREFLIGHT PREPARATION

1.1 Every pilot is urged to receive a preflight briefing and to file a flight plan. This briefing should consist of the latest or most current weather, airport, and en route NAVAID information. Briefing service may be obtained from a Flight Service Station either by telephone/interphone, by radio when airborne, or by a personal visit to the station. In the contiguous 48 States, pilots with a current FAA medical certificate may access toll-free the Direct User Access Terminal System (DUATS) through a personal computer. DUATS will provide alpha-numeric preflight weather data and allow pilots to file domestic VFR and IFR flight plans. (For a list of DUATS vendors, see MET 5.5, FAA WEATHER SERVICES.)

Note—Pilots filing flight plans via "fast file" who desire to have their briefing recorded, should include a statement at the end of the recording as to the source of their weather briefing.

1.2 The information required by the FAA to process flight plans is contained on FAA Form 7233-1, Flight Plan. (See RAC-3 FLIGHT PLAN REQUIREMENTS.) The forms are available at all flight service stations. Additional copies will be provided on request.

1.3 Consult an FSS or Weather Service Office (WSO) for preflight weather briefing. Supplemental Weather Service Locations (SWSLs) do not provide weather briefings.

1.4 FSS's are required to advise of pertinent NOTAM's if a **standard** briefing is requested, but if they are overlooked, don't hesitate to remind the specialist that you have not received NOTAM information. Additionally, NOTAM's which are known in sufficient time for publication and are of 7 days duration or longer are normally incorporated into the Notices to Airmen publication and carried there until cancellation time. FDC NOTAM's, which apply to instrument flight procedures, are also included in Notices to Airmen publication up to and including the number indicated in the FDC NOTAM legend. These NOTAM's are not provided during a briefing unless specifically requested by the pilot since the FSS specialist has no way of knowing whether the pilot has already checked Notices to Airmen publication prior to calling. Remember to ask for NOTAM's contained in the Notices to Airmen publication; they are not normally furnished during your briefing.

1.5 Pilots are urged to use only the latest issue of aeronautical charts in planning and conducting flight operations. Aeronautical charts are revised and reissued on a periodic basis to ensure that depicted data are current and reliable. In the conterminous United States, sectional charts are updated each 6 months, IFR en route charts each 56 days, and amendments to civil IFR approach charts are accomplished on a 56-day cycle with a change notice volume issued on the 28-day mid-cycle. Charts that have been superseded by those of a more recent date may contain obsolete or incomplete flight information.

1.6 When requesting a preflight briefing, identify yourself as a pilot and provide the following:

a. Type of flight planned; e.g., VFR or IFR.

b. Aircraft number or pilot's name.

c. Aircraft type.

d. Departure Airport.

e. Route of flight.

f. Destination.

g. Flight altitude (s).

h. ETD and ETE.

1.7 Prior to conducting a briefing, briefers are required to havethe background information listed above so that they may tailor the briefing to the needs of the proposed flight. The objective is to communicate a "picture" of meteorological and aeronautical information necessary for the conduct of a safe and efficient flight. Briefers use all available weather and aeronautical information to summarize data applicable to the proposed flight. They do not read weather reports and forecasts verbatim unless specifically requested by the pilot. Refer to MET-0 para 5.3.3 for those items of a weather briefing that should be expected or requested.

1.8 The Federal Aviation Administration (FAA) by Federal Aviation Regulation, Part 93, Subpart K, has designated High Density Traffic Airports (HDTA's) and has prescribed air traffic rules and requirements for operating aircraft (excluding helicopter operations) to and from these airports (Reference—Airport/Facility Directory, Special Notices Section, and AIM, Section 4-21, for further details).

1.9 In addition to the filing of a flight plan, if the flightwill traverse or land in one or more foreign countries, it is particularly important that pilots leave a complete itinerary with someone directly concerned, keep that person advised of the flights progress and inform him that, if serious doubt arises as the the safety of the flight, he should first contact the FSS.

1.10 Pilots operating aircraft underthe provisions of an FAR Part 135, ATCO, certificate and not having an FAA assigned 3-letter designator, are urged to prefix the normal aircraft registration (N) number with the letter "T" on flight plan filing.

Example: TN 1234B.

1.11 Follow IFR Procedure Event When Operating VFR

1.11.1 To maintain IFR proficiency, pilots are urged to practice IFR procedures whenever possible, even when operating VFR. Some suggested practices include:

a. Obtain a complete preflight and weather briefing. Check the NOTAM's.

b. File a flight plan. This is an excellent low cost insurance policy. The cost is the time it takes to fill it out. The insurance includes the knowledge that someone will be looking for you if your become overdue at your destination.

c. Use current charts.

d. Use the navigation aids. Practice maintaining a good course—keep the needle centered.

e. Maintain a constant altitude appropriate for direction of flight.

f. Estimate en route position times.

g. Make accurate and frequent position reports to the FSS's along your route of flight.

1.11.2 Simulated IFR flight is recommended (under the hood); however, pilots are cautioned to review and adhere to the requirements specified in FAR 91.109 before and during such flight.

1.11.3 VFR At Night

When flying VFR at night, in addition to the altitude appropriate for the direction of flight, pilots should maintain an altitude which is at or above the minimum en route altitude as shown on charts. This is especially true in mountainous terrain, where there is usually very little ground reference. Do not depend on your eyes alone to avoid rising unlighted terrain, or even lighted obstructions such as TV towers.

2. DOMESTIC NOTICE TO AIRMEN (NOTAM) SYSTEM

2.1 Time-critical aeronautical information which is of either a temporary nature or is not sufficiently known in advance to permit publication on aeronautical charts or in other operational publications, receives immediate dissemination via the National Notice to Airmen (NOTAM) System.

Note—NOTAM information is that aeronautical information that could affect a pilot's decision to make a flight. It includes such information as airport or primary runway closures, changes in the status of navigational aids, ILS, radar service availability, and other information essential to planned en route, terminal, or landing operations.

2.2 NOTAM information is classified into three categories. These are NOTAM (D) or distant, NOTAM (L) or local, and Flight Data Center (FDC) NOTAM's.

2.2.1 NOTAM (D)

2.2.1.1 NOTAM (D) information is disseminated for all navigational facilities that are part of the National Airspace System (NAS), all public use airports, seaplane bases, and heliports listed in the Airport/Facility Directory (A/FD). The complete file of all NOTAM (D) information is maintained in a computer data base at the National Communications Center (NATCOM), located in Kansas City, Missouri. This category of information is distributed automatically, appended to the hourly weather reports, via the Service A telecommunications system. Air traffic facilities, primarily FSS's, with Service A capability have access to the entire NATCOM data base of NOTAM's. These NOTAM's remain available via Service A for the duration of their validity or until published.

2.2.2 NOTAM (L)

2.2.2.1 NOTAM (L) information includes such data as taxiway closures, personnel and equipment near or crossing runways, airport rotating beacon outages, and airport lighting aids that do not affect instrument approach criteria, such as VASI.

2.2.2.2 NOTAM (L) information is distributed locally only and is not attached to the hourly weather reports. A separate file of local NOTAM's is maintained at each FSS for facilities in their area only. NOTAM (L) information for other FSS areas must be specifically requested directly from the FSS that has responsibility for the airport concerned.

Note—DUATS vendors are not required to provide NOTAM (L) information.

2.2.3 FDC NOTAM's

2.2.3.1 On those occasions when it becomes necessary to disseminate information which is regulatory in nature, the National Flight Data Center (NFDC) in Washington, D.C., will issue an FDC NOTAM. FDC NOTAM's contain such things as amendments to published IAP's and other current aeronautical charts. They are also used to advertise temporary flight restrictions caused by such things as natural disasters or large scale public events that may generate a congestion of air traffic over a site.

2.2.3.2 FDC NOTAM's are transmitted via Service A only once and are kept on file at the FSS until published or canceled. FSS's are responsible for maintaining a file of current, unpublished FDC NOTAM's concerning conditions within 400 miles of their facilities. FDC information concerning conditions that are more than 400 miles from the FSS, or that is already published, is given to a pilot only on request.

Note 1—DUATS vendors will provide FDC NOTAM's only upon site-specific requests using a location identifier.

Note 2—NOTAM data may not always be current due to the changeable nature of the National Airspace System components, delays inherent in processing the information, and occasional temporary outages of the United States NOTAM System. While en route, pilots should contact FSS's and obtain updated information for their route of flight and destination.

2.3 An integral part of the NOTAM System is the biweekly Notice to Airmen publication. Data is included in this publication to reduce congestion on the telecommunications circuits and, therefore, is not available via Service A. Once published, this information is not provided during pilot weather briefings unless specifically requested by the pilot. This publication contains two sections:

2.3.1 The first section consists of notices which meet the criteria for NOTAM (D), and are expected to remain in effect for an extended period, and FDC NOTAM's current at the time of publication. Occasionally, some NOTAM (L) and other unique information is included in this section when it will contribute to flight safety.

2.3.2 The second section contains special notices that are too long or concern a wide or unspecified geographic area and are not suitable for inclusion in the first section. The content of these notices vary widely and there are no specific criteria for their inclusion, other than their enhancement of flight safety.

2.3.3 The number of the last FDC NOTAM included in the publication is noted on the first page to aid the user in updating the listing contained, with any FDC NOTAM's which may have been issued between the cutoff date and the date the publication is received. All information contained will be carried until the information expires, is canceled, or in the case of permanent conditions, is published in other publications, such as the A/FD.

2.3.4 All new notices entered, excluding FDC NOTAM's, will be published only if the information is expected to remain in effect for at least 7 days after the effective date of the publication.

2.4 NOTAM information is not available from a Supplemental Weather Service Location (SWSL).

3. FLIGHT PLAN REQUIREMENTS

Flight plans are required for flights into airspace controlled by an ATC facility. Class A, B, C, D and E airspace is defined in

RAC 3-4. (See RAC 3.1; 3, for detailed flight plan illustration.) The types of flight plans in U.S. airspace are;

Visual Flight Rules (VFR

Defense Visual Flight Rules (DVFR

Instrument Flight rules (IFR)

Composite Flight Plan Visual-Instrument Flight Rules (VFR-IFR)

IFR flight plans requesting VFR operations

Note—ICAO flight plans are required whenever the flight intends to cross an international boundary or an oceanic CTA/FIR boundary. For flights departing U.S. airports and operate over U.S. domestic airspace and/or offshore control areas, but do not penetrate the oceanic CTA/FIR boundary or borders, a U.S. domestic flight plan is preferred.

3.1 Flight Plan—VFR Flights

3.1.1 Except for operations in or penetrating a Coastal or Domestic ADIZ or DEWIZ (see RAC 8), a flight plan is not required for VFR flight; however, it is strongly recommended that one be filed.

3.1.2 To obtain maximum benefits of the flight plan program, flight plans should be filed directly with the nearest flight service station. for your convenience, FSS's provide one-call (telephone/interphone) or one-stop (personal) aeronautical and meteorological briefings while accepting flight plans. Radio may be used to file if no other means are available. Also, some states operate aeronautical communications facilities which will accept and forward flight plans to the FSS for further handling.

3.1.3 When a "stopover" flight is anticipated to cove an extended period of time, it is recommended that a separate flight plan be filed for each "leg" when the stop is expected to be more than one hour duration.

3.1.4 Pilots are encouraged to give their departure times directly to the flight service station serving the departure airport or as otherwise indicated by the FSS when the flight plan is filed. This will ensure more efficient flight plan service and permit the FSS to advise you of significant changes in aeronautical facilities or meteorological conditions. When a VFR flight plan is filed, it will be held by the FSS until one hour after the proposed departure time and then canceled unless:

a. The actual departure time is received.

b. A revised proposed departure time is received.

c. At a time of filing, the FSS is informed that the proposed departure time will be met, but actual time cannot be given because of inadequate communications (assumed departures).

3.1.5 On pilot's request, at a location having an active tower, the aircraft identification will be forwarded by the tower to the FSS for reporting the actual departure time. This procedure should be avoided at busy airports.

3.1.6 Although position reports are not required for VFR flight plans, periodic reports to FAA Flight Service Stations along the route are good practice. Such contacts permit significant information to be passed to the transiting aircraft and also serve to check the progress of the flight should it be necessary for any reason to locate the aircraft.

Example 1:

Bonanza 31K, over Kingfisher at (time), VFR flight plan, Tulsa to Amarillo.

Example 2:

Cherokee 5123J, over Oklahoma city at (time), Shreveport to Denver, no flight plan.

3.1.7 Pilots not operating on an IFR flight plan, and when in level cruising flight, are cautioned to conform with VFR cruising altitudes appropriate to direction of flight.

3.1.8 Indicate aircraft equipment capabilities when filing VFR flight plans by appending the appropriate suffix to aircraft type in the same manner as that prescribed for IFR flight (see FLIGHT PLAN-IFR FLIGHTS 3.3.5.1 Block 3). Under some circumstances, ATC computer tapes can be useful in constructing the radar history of a downed or crashed aircraft. In each case, knowledge of the aircraft's transponder equipment is necessary in determining whether or not such computer tapes might prove effective.

3.1.9 *Flight Plan Form*

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAAL AVIATION ADMINISTRATION
FLIGHT PLAN

(FAA USE ONLY) ☐ PILOT BRIEFING ☐ VNR ☐ STOPOVER | TIME STARTED | SPECIALIST INITIALS

1. TYPE	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED	5. DEPARTURE POINT	6. DEPARTURE TIME		7. CRUISING ALTITUDE
☐ VFR ☐ IFR ☐ DVFR			KTS		PROPOSED (Z)	ACTUAL (Z)	

8. ROUTE OF FLIGHT

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE		11. REMARKS
	HOURS	MINUTES	

12. FUEL ON BOARD	13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE	15. NUMBER ABOARD
		17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	

16. COLOR OF AIRCRAFT

CIVIL AIRCRAFT PILOTS. FAR 91 requires you file an IFR flight plan to operate under Instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH ______________ FSS ON ARRIVAL

FAA Form 7233-1 (8-82)

3.1.10 *Explanation of VFR Flight plan items*

Block 1. Check the type flight plan. Check both the VFR and IFR blocks if composite VFR/IFR.

Block 2. Enter your complete aircraft identification including the prefix "N" if applicable.

Block 3. Enter the designator for the aircraft or, if unknown, the aircraft manufacturer's name.

Block 4. Enter your true airspeed (TAS).

Block 5. Enter the departure airport identifier code (or the name if identifier is unknown).

Block 6. Enter the proposed departure time in Coordinated Universal Time (UTC). If airborne, specify the actual or proposed departure time as appropriate.

Block 7. Enter the appropriate VFR altitude (to assist the briefer in providing weather/wind information).

Block 8. Define the route of flight by using NAVAID identifier codes and airways.

Block 9. Enter the destination airport identifier code (or name if identifier is unknown).

Block 9 Note. Include the city name (or even the state name) if needed for clarity.

Block 10. Enter your estimated time en route, in hours and minutes.

Block 11. Enter only those remarks pertinent to ATC or to the clarification of other flight plan information such as the appropriate radiotelephony (call sign) associated with the designator filled in Block 2. Items of a personal nature are not accepted.

Block 12. Specify the fuel on board, in hours and minutes.

Block 13. Specify an alternate airport if desired.

Block 14. Enter your complete name, address, and telephone number. Enter sufficient information to identify home base, airport, or operator.

Block 14 Note. This information is essential in the event of search and rescue operations.

Block 15. Enter total number of persons on board including crew (POB).

Block 16. Enter the predominant color(s).

Block 17. Record the FSS name for closing the flight plan. If the flight plan is closed with a different FSS or a Air Traffic facility, state the recorded FSS name that would normally have closed your flight plan. **(Optional)**—Record a destination telephone number to assist Search and Rescue contact should you fail to report or cancel your flight plan within 1/2 hour after your estimated time of arrival (ETA). *Caution: A control tower at destination point does not automatically close VFR flight plans, it remains the responsibility of a pilot to close his own flight plan.*

Block 17. Note—The information transmitted to the destination FSS will consist only of flight plans blocks 2,3,9, and 10. Estimated time en route (ETE) will be converted to the correct estimated time of arrival (ETA).

3.2 Flight Plan—Defense VFR (DVFR) FLIGHTS

VFR flights into a Coastal or Domestic ADIZ/DEWIZ are required to file DVFR flight plans for security purposes. Detailed ADIZ procedures are found in RAC 8. (See Far 99.)

3.3 Flight Plan—IFR Flights

3.3.1 *General*

3.3.1.1 Prior to departure from within, or prior to entering Class A, B, C, D and E airspace, a pilot must submit a complete flight plan and receive an air traffic clearance if weather conditions are below VFR minimums. Instrument flight plans may be submitted to the nearest Flight Service Station or the airport traffic control tower either in person or by telephone (or by radio if no other means are available). Pilots should file IFR flight plans at least 30 minutes prior to estimated time of departure to preclude possible delay in receiving a departure to preclude possible delay in receiving a departure clearance from ATC. To minimize your delay in entering a Class B, C, D or E surface area at destination when IFR weather conditions exist or are forecast at the airport, an IFR flight plan should be filed before departure. Otherwise, a 30-minute delay is not unusual in receiving an ATC clearance because of time spent in processing flight plan data. Traffic saturation frequently prevents control personnel from accepting flight plans by radio. In such cases the pilot is advised to contact the nearest flight services station for the purpose of filing the flight plan.

Note—There are several methods of obtaining IFR clearance at nontower, nonflight service stations and outlying airports. The procedure may vary due to geographical features, weather conditions, and the complexity of the ATC system. To determine the most effective means of receiving an IFR clearance, pilots should ask the nearest flight service station for the most appropriate means of obtaining the IFR clearance.

3.3.1.2 When filing an IFR flight plan for a Traffic Alert and Collision Avoidance System (TCAS)/heavy equipped aircraft, add the prefix "T" for TCAS, "H" for Heavy, or "B" for both TCAS and heavy to the aircraft type.

Example:

H/DC10/U T/B727/A B/747/R

3.3.1.3 When filing an IFR flight plan for flight in an aircraft equipped with a radar beacon transponder, DME equipment, TACAN-only equipment or an combination of both, identify equipment capability by adding a suffix to the AIRCRAFT TYPE preceded by a slant, as follows:

/X	no transponder
/T	transponder with no altitude encoding capability.
/U	transponder with altitude encoding capability.
/D	DME, no transponder.
/B	DME, transponder with no altitude encoding capability.
/A	DME, transponder with altitude encoding capability.
/M	TACAN-only, no transponder
/N	TACAN-only, transponder with no altitude encoding capability.
/P	TACAN-only, transponder with altitude encoding capability.
/C	RNAV, transponder with no altitude encoding capability.
/R	RNAV, transponder with altitude encoding capability.
/W	RNAV, no transponder.
/G	Flight Management System (FMS) and Electronic Flight Instrument System (EFIS) equipped aircraft with /R capability having a "Special Aircraft and Aircrew Authorization" issued by the FAA.

Note 1—Criteria for use of the /G designation is presently indentified only for certain /R equipped air carrier aircraft and specially qualified crews. Authorization for use of the "/G" designation is obtained through the All-Weather Operations Branch of the FAA Flight Standards Service and an air carrier's certificate holding district office.

Note 2—The use of "/G" is limited to aircraft which operate totally within airspace controlled by U.S. air traffic control facilities.

3.3.1.4 It is recommended that pilots file the maximum transponder/navigation capability of their aircraft in the equipment suffix. This will provide air traffic control with the necessary information to utilize all facets of navigational equipment and transponder capabilities available. In the case of area navigation equipped aircraft, pilots should file the /C, /R, or /W capability of the aircraft even though an RNAV route or random RNAV route has not been requested. This will ensure ATC awareness of the pilot's ability to navigate point-to-point and may by utilized to expedite the flight.

Note—The suffix is not to be added to the aircraft identification or be transmitted by radio as part of the aircraft identification.

3.3.2 *Airways/Jet Routes Depiction on Flight Plan*

3.3.2.1 It is vitally important that the route of flight be accurately and completely described in the flight plan. To simplify definition of the proposed route, and to facilitate air traffic control, pilots are requested to file via airways or jet routes established for use at the altitude or flight level planned.

3.3.2.2 If flight is to be conducted via designated airways or jet routes, describe the route by indicating the type and number designators of the airway(s) or jet route(s) requested. If more than one airway or jet route is to be used, clearly indicate points of transition. If the transition is made at an unnamed intersection, show the next succeeding NAVAID or named intersection on the intended route and the complete route from that point. Reporting points should be identified by using authorized name/code as depicted on appropriate aeronautical charts. The following two examples illustrate the need to specify the transition point when two routes share more than one transition fix.

Example 1:

ALB J37 BUMPY J14 BHM

Spelled out: From Albany, New York, via Jet Route 37, transitioning to Jet Route 14 at BUMPY intersection, thence via Jet Route 14 to Birmingham, Alabama.

Example 2:

ALB J37 ENO J14 BHM

Spelled Out: From Albany, New York, via Jet Route 37 transitioning to Jet Route 14 at Kenton VORTAC (ENO), thence via Jet Route 14 to Birmingham, Alabama.

3.3.2.2.1 The route of flight may also be described by naming the reporting points or NAVAID's over which the flight will pass, provided the points named are established for use at the altitude or flight level planned.

Example:

BWI V44 SWANN V433 DQO

Spelled Out: From Baltimore-Washington International, via Victor 44 to SWANN Intersection, transitioning to Victor 433 at SWANN, thence via V433 to Dupont.

3.3.2.2.2 When the route of flight is defined by named reporting points, whether alone or in combination with airways or jet routes, and the navigational aids (VOR, VORTAC, TACAN, LF, RBN) to be used for the flight are a combination of different types of aids, enough information should be included to clearly indicate the route requested.

Example:

LAX J5 LKV J3 GEG YXC FL 330 J500 VLR J515 YWG

Spelled Out: From Los Angeles International via Jet Route 5 Lakeview, Jet Route 3 Spokane, direct Cranbrook, British Columbia VOR/DME, Flight Level 330, Jet Route 500 to Langruth, Manitoba VORTAC, Jet Route 515 to Winnipeg, Manitoba.

3.3.2.2.3 When filing IFR, it is to the pilot's advantage to file a "preferred route."

Note—Preferred IFR routes are described and tabulated in the Airport/Facility Directory.

3.3.2.2.4 ATC may issue Standard Instrument Departure (SID) or a Standard Terminal Arrival (STAR) as appropriate (See RAC 4).

Note—Pilots not desiring a SID/STAR should so indicate in the remark section of the flight plan as "NO SID" or "NO STAR."

3.3.3 *Direct Flights*

3.3.3.1 All or any portions of the route which will not be flown on the radials/courses of established airways or routes; e.g., direct route flights, must be defined by indicating the radio fixes over which the flight will pass. Fixes selected to define the route shall be those over which the position of the aircraft can be accurately determined. Such fixes automatically become compulsory reporting points for the flight, unless advised otherwise by ATC. Only those navigational aids established for use in a particular structure; i.e., in the Low or High structures, may be used to define the en route phase of a direct flight within that structure.

3.3.3.2 The azimuth feature of VOR aids and the azimuth and distance (DME) features of VORTAC/TACAN aids are assigned certain frequency protected areas of airspace which are intended for application to established airway and route use, and to provide guidance for planning flights outside of established airways or routes. These areas of airspace are expressed in terms of cylindrical service volume of specified dimensions called "class limits" or "categories." An operational service volume has been established for each class in which adequate signal coverage and frequency protection can be assured. To facilitate use of VOR, VORTAC, or TACAN aids, consistent with their operational service volume limits, pilot use of such aids for defining a direct route of flight in Class A, B, C, D and E airspace should not exceed the following:

(1) Operations above Flight Level 450—Use aids not more than 200 nautical miles apart. These aids are depicted on the Enroute High Altitude Chart—U.S.

(2) Operation off established routes from 18,000 feet MSL to Flight Level 450—Use aids not more than 260 nautical miles apart. These aids are depicted on the Enroute High Altitude Chart—U.S.

(3) Operation off established airways below 18,000 feet MSL—Use aids not more than 80 nautical miles apart. These aids are depicted on the Enroute Low Altitude Chart—U.S.

(4) Operation off established airways between 14,500 feet MSL and 17,999 feet MSL in the conterminous United States—(H) facilities not more than 200 NM apart may be used.

3.3.3.3 Increasing use of self-contained airborne navigational systems which do not rely on the VOR/VORTAC/TACAN system has resulted in pilot requests for direct routes which exceed NAVAID service volume limits. These direct route requests will be approved only in a radar environment, with approval based on pilot responsibility for navigation on the authorized direct route. "Radar flight following" will be provided by ATC for air traffic control purposes.

3.3.3.4. At times, ATC will initiate a direct route in a radar environment which exceeds NAVAID service volume limits. In such cases ATC will provide radar monitoring and navigational assistance as necessary.

3.3.3.5. Airway or jet route numbers, appropriate to the stratum in which operation will be conducted, may also be included to describe portions of the route to be flown.

Example:

MDW V262 BDF V10 BRL STJ SLN GCK

Spelled Out: From Chicago Midway Airport via Victor 262 to Bradford, Victor 10 to Burlington, Iowa, direct St. Joseph, Missouri, direct Salina, Kansas, direct Garden City, Kansas.

Note—When route of flight is described by radio fixes, the pilot will be expected to fly a direct course between the points named.

3.3.3.6. Pilots are reminded that they are responsible for adhering to obstruction clearance requirements on those segments of direct routes that are outside of Class A, B, C, D and E airspace. The MEA's and other altitudes shown on Low Altitude IFR Enroute Charts pertain to those route segments within Class A, B, C, D and E airspace, and those altitudes may not meet obstruction clearance criteria when operating off those routes.

3.3.4 *Area Navigation (RNAV)*

3.3.4.1 Random RNAV routes can only be approved in a radar environment. Factors that will be considered by ATC in approving random RNAV routes include the capability to provide radar monitoring and compatibility with traffic volume and flow. ATC will radar monitor each flight, however, navigation on the random RNAV route is the responsibility of the pilot.

3.3.4.2 To be certified for use in the National Airspace System, RNAV equipment must meet the specifications outlined in AC 90-45. The pilot is responsible for variations in equipment capability, and must advise ATC if a RNAV clearance can not be accepted as specified. The controller need only be concerned that the aircraft is RNAV equipped; if the flight plan equipment suffix denotes RNAV capability, the RNAV routing can be applied.

3.3.4.3 Pilots of aircraft equipped with operational area navigation equipment may file for random RNAV routes throughout the National Airspace System, where radar monitoring by ATC is available, in accordance with the following procedures.

(1) File airport to airport flight plans prior to departure.

(2) File the appropriate RNAV capability certification suffix in the flight plan.

(3) Plan the random route portion of the flight plan to begin and end over appropriate arrival/departure transition fixes or appropriate navigation aids for the altitude stratum within which the flight will be conducted. The use of normal preferred departure and arrival routes (SID/STAR), where established, is recommended.

(4) File route structure transitions to and from the random route portion of the flight.

(5) Define random routes by waypoints. File route description waypoints by using degree-distance fixes based on navigational aids which are appropriate for the altitude stratum.

(6) File a minimum of one route description waypoint for each ARTCC through whose area the random route will be flown. These waypoints must be located within 200 NM of the preceding center's boundary.

(7) File an additional route description waypoint for each turnpoint in the route.

(8) Plan additional route description waypoints as required to ensure accurate navigation via the filed route of flight. Navigation is the pilots's responsibility unless ATC assistance is requested.

(9) Plan the route of flight so as to avoid Prohibited and Restricted Airspace by 3 NM unless permission has been obtained to operate in that airspace and the appropriate ATC facilities are advised.

3.3.4.4 Pilots of aircraft equipped with latitude/longitude coordinate navigation capability independent of VOR/TACAN references may file for random RNAV routes at and above FL 390 within the conterminous United States using the following procedures.

(1) File airport to airport flight plans prior to departure.

(2) File the appropriate RNAV capability certification suffix in the flight plan.

(3) Plan the random route portion of the flight to begin and end over published departure/arrival transition fixes or appropriate navigation aids for airports without published transition procedures. The use of preferred departure and arrival routes, such as SID and STAR where established, is recommended.

(4) Plan the route of fight so as to avoid prohibited and restricted airspace by 3 NM unless permission has been obtained to operate in that airspace and the appropriate ATC facility is advised.

(5) Define the route of flight after the departure fix, including each intermediate fix (turnpoint) and the arrival fix for the destination airport, in terms of latitude/longitude coordinates plotted to the nearest minute. The arrival fix must be identified by both the latitude/longitude coordinates and a fix identifier.

Example:

a	b	c	d	e
MIA	SRQ	3407/10615	3407/11546 TNP	LAX

a. Departure airport

b. Departure fix

c. Intermediate fix (turning point)

d. Arrival fix

e. Destination airport.

(6) Record latitude/longitude coordinates by four figures describing latitude in degrees and minutes followed by a solidus and five figures describing longitude in degrees and minutes.

(7) File at FL 390 or above for the random RNAV portion of the flight.

(8) Fly all routes/route segments on Great Circle tracks.

(9) Make any in-flight requests for random RNAV clearances or route amendments to an en route ATC facility.

3.3.5 *Flight Plan Form*

U.S. DEPARTMENT OF TRANSPORTATION FEDERAAL AVIATION ADMINISTRATION FLIGHT PLAN	(FAA USE ONLY) ☐ PILOT BRIEFING ☐VNR ☐ STOPOVER	TIME STARTED	SPECIALIST INITIALS

1. TYPE VFR IFR DVFR	2. AIRCRAFT IDENTIFICATION	3. AIRCRAFT TYPE/ SPECIAL EQUIPMENT	4. TRUE AIRSPEED KTS	5. DEPARTURE POINT	6. DEPARTURE TIME PROPOSED (Z) / ACTUAL (Z)	7. CRUISING ALTITUDE

8. ROUTE OF FLIGHT

9. DESTINATION (Name of airport and city)	10. EST. TIME ENROUTE HOURS / MINUTES	11. REMARKS

12. FUEL ON BOARD	13. ALTERNATE AIRPORT(S)	14. PILOT'S NAME, ADDRESS & TELEPHONE NUMBER & AIRCRAFT HOME BASE 17. DESTINATION CONTACT/TELEPHONE (OPTIONAL)	15. NUMBER ABOARD

16. COLOR OF AIRCRAFT	CIVIL AIRCRAFT PILOTS. FAR 91 requires you file an IFR flight plan to operate under instrument flight rules in controlled airspace. Failure to file could result in a civil penalty not to exceed $1,000 for each violation (Section 901 of the Federal Aviation Act of 1958, as amended). Filing of a VFR flight plan is recommended as a good operating practice. See also Part 99 for requirements concerning DVFR flight plans

FAA Form 7233-1 (8-82) CLOSE VFR FLIGHT PLAN WITH _______________ FSS ON ARRIVAL

FAA Form 7233-1 (8-82)

3.3.5.1 *Explanation of IFR Flight plan items*

Block 1. Check the type flight plan. Check both the VFR and IFR blocks if composite VFR/IFR.

Block 2. Enter your complete aircraft identification including the prefix "N" if applicable.

Block 3. Enter the designator for the aircraft or, if unknown, the aircraft manufacturer's name; e.g., Cessna, followed by a slant (/) and the transponder/DME equipment code letter; e.g., C-182U. Heavy aircraft add prefix "H" to aircraft type: Example: H/DC10/U.

Block 4. Enter your computer true airspeed (TAS). Note: If the average TAS changes plus or minus 5 percent or 10 knots, whichever is greater, advise ATC.

Block 5. Enter the departure airport identifier code (or the name if identifier is unknown). Note: Use of identifier codes will expedite the processing of your flight plan.

Block 6. Enter the proposed departure time in Coordinated Universal Time (UTC) (Z). If airborne, specify the actual or proposed departure time as appropriate.

Block 7. Enter the requested en route altitude or flight level. Note: Enter only the initial requested altitude in this block. When more than one IFR altitude or flight level is desired along the route of flight, it is best to make a subsequent request direct to the controller.

Block 8. Define the route of flight by using NAVAID identifier codes (or names if the code is unknown), airways, jet routes, and waypoints (for RNAV). Note: Use NAVAID's or Waypoints to define direct routes and radials/bearing to define other unpublished routes.

Block 9. Enter the destination airport identifier code (or name if identifier is unknown).

Block 10. Enter your estimated time en route based on latest forecast winds.

Block 11. Enter only those remarks pertinent to ATC or to the clarification of other flight plan information such as the appropriate radiotelephony (call sign) associated with the designator filled in Block 2. Items of a personal nature are not accepted. Do not assume that remarks will be automatically transmitted to every controller. Specific ATC or en route requests should be made directly to the appropriate controller.

Block 12. Specify the fuel on board, computed from the departure point.

Block 13. Specify an alternate airport if desired or required, but do not include routing to the alternate airport.

Block 14. Enter your complete name, address, and telephone number of pilot in command or, in the case of a formation flight, the information commander. Enter sufficient information to identify home base, airport, or operator. Note: This information would be essential in the event of a search and rescue operation.

Block 15. Enter the total number of persons on board including crew.

Block 16. Enter the predominant color(s).

Note—Close IFR flight plans with tower, approach control, ARTCC's, or if unable, with FSS. When landing at an airport with a functioning control tower, IFR flight plans are automatically canceled.

3.3.5.2 The information transmitted to the ARTCC for IFR Flight Plans will consist of only flight plan blocks 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11.

3.3.5.3 A description of the International Flight Plan Form is contained in the International Flight Information Manual.

3.4 IFR Operations to High Altitude Destinations

3.4.1 Pilots planning IFR flights to airports located in mountainous terrain are cautioned to consider the necessity for an alternate airport even when the forecast weather conditions would technically relieve them from the requirement to file one (Reference: FAR 91.167). The FAA has identified three possible situations where the failure to plan for an alternate airport when flying IFR to such destination airport could result in a critical situation if the weather is less than forecast and sufficient fuel is not available to proceed to a suitable airport.

3.4.2 An IFR flight to an airport where the MDA's or landing visibility minimums for ALL INSTRUMENT APPROACHES are higher than the forecast weather minimums specified in FAR 91.167. For example, there are 11 high altitude airports in the United States with approved instrument approach procedures where all of the Minimum Descent Altitudes (MDA's) are greater than 2,000 feet and/or the landing visibility minimums are greater than 3 miles (Bishop, California; South Lake Tahoe, California; Ukiah, California; Aspen-Pitkin Co./Sardy Field, Colorado; Butte, Montana; Helena, Montana; Missoula, Montana; Chadron, Nebraska; Ely, Nevada; Klamath Falls, Oregon; and Omak, Washington). In the case of these 11 airports, it is possible for a pilot to elect, on the basis of forecasts, not to carry sufficient fuel to get to an alternate when the ceiling and/or visibility is actually lower than that necessary to complete the approach.

3.4.3 A small number of other airports in mountainous terrain have MDA's which are slightly (100 to 300 feet) below 2000 feet AGL. In situations where there is an option as to whether to plan for an alternate, pilots should bear in mind that just a slight worsening of the weather conditions from those forecasts could place the airport below the published IFR landing minimums.

3.4.4 An IFR flight to an airport which requires special equipment; i.e. DME, glide slope, etc., in order to make the available approaches to the lowest minimums. Pilots should be aware that all other minimums on the approach charts may require weather conditions better than those specified in FAR 91.167. An inflight equipment malfunction could result in the inability to comply with the published approach procedures or, again, in the position of having the airport below the published IFR landing minimums for all remaining instrument approach alternatives.

3.5 Composite Flight Plan (VFR/IFR Flights)

3.5.1 Flight plans which specify VFR operation for one portion of a flight, and IFR for another portion, will be accepted by the FSS at the point of departure. If VFR flight is conducted for the first portion of the flight, the pilot should report his departure time to the FSS with which he filed his VFR/IFR flight plan; and, subsequently, close the VFR portion and request ATC clearance from the FSS nearest the point at which change from VFR to IFR is proposed. Regardless of the type facility you are communicating with (FSS, center, or tower), it is the pilot's responsibility to request that facility to "CLOSE VFR FLIGHT PLAN." The pilot must remain in VFR weather conditions until operating in accordance with the IFR clearance.

3.5.2 When a flight plan indicates IFR for the first portion of flight and VFR for the latter portion, the pilot will normally be cleared to the point at which the change is proposed. Once the pilot has reported over the clearance limit and does not desire further IFR clearance, he should advise Air Traffic Control to cancel the IFR portion of his flight plan. Then, he should contact the nearest FSS to activate the VFR portion of his flight plan. If the pilot desires to continue his IFR flight plan beyond the clearance limit, he should contact Air Traffic Control at least five minutes prior to the clearance limit and request further IFR clearance. If the requested clearance is not received prior to reaching the clearance limit fix, the pilot will be expected to establish himself in a standard holding pattern on the radial/course to the fix unless a holding pattern for the clearance limit fix is depicted on a U.S. Government or commercially produced (meeting FAA requirements) Low/High Altitude Enroute, Area, or STAR chart. In this case the pilot will hold according to the depicted pattern

4. INITIATING A CHANGE TO FLIGHT PLANS ON FILE

4.1 Changes to proposed flight plans should be initiated through the Flight Service Station with which the flight plan was originally filed. if this is not possible, initiate changes through the nearest FSS or ATC facility. All changes should be initiated at least 30 minutes prior to departure to insure that the change can be effected prior to the ATC clearance delivery.

4.1.1 *Change in Proposed Departure time*

4.1.1.1 To prevent computer saturation in the en route environment, time out parameters have been established to delete non-activated proposed departure flight plans. Most centers have this parameter set so as to delete these flight plans a minimum of

1 hour after the proposed departure time. To ensure that a flight plan remains active, pilots whose actual departure time will be delayed 1 hour or more beyond their filed departure time, are requested to notify ATC of their departure time.

4.1.1.2 Due to traffic saturation, control personnel frequently will be unable to accept these revisions via radio. It is recommended that you forward these revisions to the nearest flight service station.

4.1.2 *Other Changes*

In addition to altitude/flight level, destination and/or route changes, increasing or decreasing the speed of an aircraft constitutes a change in a flight plan. Therefore, at any time the average true airspeed at cruising altitude between reporting points varies or is expected to vary from that given in the flight plan by *plus or minus 5 percent, or 10 knots, whichever is greater,* air traffic control should be advised.

5. CANCELING FLIGHT PLANS

5.1 Closing VFR and DVFR Flight Plans

A pilot is responsible for ensuring that his VFR or DVFR flight plan is canceled (See FAR 91.153). You should close your flight plan with the nearest Flight Service Station, or if one is not available you may request any ATC facility to relay your cancellation to the FSS. *Control towers do not automatically close VFR or DVFR flight plans* as they may not be aware that a particular VFR aircraft is on a flight plan. If you fail to report or cancel your flight plan within ½ hour after your ETA, search and rescue procedures are started. (See AIP section SAR.)

5.2 Canceling IFR Flight Plan

5.2.1 FAR 91.153 includes the statement "When a flight plan has been filed, the pilot in command, upon canceling or completing the flight under the flight plan, shall notify the nearest Flight Service Station or ATC facility."

5.2.2 An IFR flight plan may be canceled at any time the flight is operating in VFR conditions outside Class A airspace by the pilot stating "CANCEL MY IFR FLIGHT PLAN" to the controller or air/ground station with which he is communicating. Immediately after canceling an IFR flight plan, a pilot should take necessary action to change to the appropriate air/ground frequency, VFR radar beacon code and VFR altitude or flight level.

5.2.3 ATC separation and information services will be discontinued, including radar services (where applicable). Consequently, if the canceling flight desires VFR radar advisory service the pilot must specifically request it.

Note—Pilots must be aware that other procedures may be applicable to a flight that cancels an IFR flight plan within an area where a special program, such as a designated Terminal Radar Service Area, Class C airspace or Class B airspace, has been established.

5.2.4 If a DVFR flight plan requirement exists the pilot is responsible for filing this flight plan to replace the canceled IFR flight plan. If a subsequent IFR operation becomes necessary, a new IFR flight plan must be filed and an ATC clearance obtained before operating in IFR conditions.

5.2.5 If operating on an IFR flight plan to an airport with a functioning control tower, the flight plan is automatically closed upon landing.

5.2.6 If operating on an IFR flight plan to an airport where there is no functioning control tower, the pilot must initiate cancellation of the IFR flight plan. This can be done after landing if there is a functioning Flight Service Station or other means of direct communications with ATC. In the event there is no Flight Service Station and air/ground communications with ATC is not possible below a certain altitude, the pilot would, weather conditions permitting, cancel his IFR flight plan while still airborne and able to communicate with ATC by radio. This will not only save the time and expense of canceling the flight plan by telephone but will quickly release the airspace for use by other aircraft.

ATC CLEARANCE AND SEPARATION—PILOT/CONTROLLER ROLES AND RESPONSIBILITIES

1. CLEARANCE

A clearance issued by ATC is predicated on known traffic and known physical airport conditions. An ATC clearance means an authorization by ATC, for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified conditions within Class A, B, C, D and E airspace. IT IS NOT AUTHORIZATION FOR A PILOT TO DEVIATE FROM ANY RULE, REGULATION OR MINIMUM ALTITUDE NOR TO CONDUCT UNSAFE OPERATION OF HIS AIRCRAFT.

1.1

FAR 91.3(a) states: ''The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.'' If ATC issues a clearance that would cause a pilot to deviate from a rule or regulation, or in the pilot's opinion, would place the aircraft in jeopardy, IT IS THE PILOT'S RESPONSIBILITY TO REQUEST AN AMENDED CLEARANCE. Similarly, if a pilot prefers to follow a different course of action, such as make a 360 degree turn for spacing to follow traffic when established in a landing or spacing to follow traffic when established in a landing or approach sequence, land on a different runway, takeoff from a different intersection, takeoff from the threshold instead of an intersection or delay his operation, HE IS EXPECTED TO INFORM ATC ACCORDINGLY. When he requests a different course of action, however, the pilot is expected to cooperate so as to preclude the disruption of the traffic flow or the creation of conflicting patterns. The pilot is also expected to use the appropriate aircraft call sign to acknowledge all ATC clearances, frequency changes, or advisory information.

1.2

Each pilot who deviates from an ATC clearance in response to a Traffic Alert and Collision Avoidance System resolution advisory shall notify ATC of that deviation as soon as possible

1.3

When weather conditions permit, during the time an IFR flight is operating, it is the direct responsibility of the pilot to avoid other aircraft since VFR flights may be operating in the same area without the knowledge of ATC, and traffic clearances provide standard separation only between IFR flights.

1.4 Clearance Items

An ATC clearance normally contains the following:

1.4.1 Clearance Limit

The traffic clearance issued prior to departure will normally authorize flight to the airport of intended landing. Under certain conditions at some locations, a short-range clearance procedure is utilized whereby a clearance is issued to a fix within or just outside the terminal area and the pilot is advised of the frequency on which he will receive the long-range clearance direct from the center controller.

1.4.2 Departure Procedure

Headings to fly and altitude restrictions may be issued to separate a departure from other air traffic in the terminal area. Where the volume of traffic warrants Standard Instrument Departures (SID's) have been developed. (See RAC 4.)

1.4.3 Route of Flight

1.4.3.1 Clearances are normally issued for the altitude/flight level and route filed by the pilot. However, due to traffic conditions, it is frequently necessary for ATC to specify an altitude/flight level or route different from that requested by the pilot. In addition, flow patterns have been established in certain congested areas, or between congested areas, whereby traffic capacity is increased by routing all traffic on preferred routes. Information on these flow patterns is available in offices where preflight briefing is furnished or where flight plans are accepted.

1.4.3.2 When required air traffic clearances include data to assist pilots in identifying radio reporting points. It is responsibility of a pilot to notify ATC immediately if his radio equipment cannot receive the type of signals he must utilize to comply with his clearance.

1.4.4 Altitude Data

1.4.4.1 The altitude/flight level instructions in an ATC clearance normally require that a pilot ''MAINTAIN'' the altitude/flight level to which the flight will operate when in Class A, B, C, D and E airspace. Altitude/flight level changes while en route should be requested prior to the time the change is desired.

1.4.4.2 When possible, if the altitude assigned is different than that requested by the pilot, ATC will inform an aircraft when to expect climb or descent clearance or to request altitude change from another facility. If this has not been received prior to crossing the boundary of the ATC facility's area and assignment at a different flight level is still desired, the pilot should reinitiate his request with the next facility.

1.4.4.3 The term ''CRUISE'' may be used instead of ''MAINTAIN'' to assign a block of airspace, to a pilot, from the minimum IFR altitude up to and including the altitude specified in the cruise clearance. The pilot may level off at any intermediate altitude within this block of airspace. Climb/descent within the block is to be made at the discretion of the pilot. However, once the pilot starts descent and verbally reports leaving an altitude in the block, he may not return to that altitude without additional ATC clearance.

1.4.5 Holding Instructions

1.4.5.1 Whenever an aircraft is cleared to a fix other than the destination airport and delay is expected, it is the responsibility of the ATC controller to issue complete holding instructions (unless the pattern is charted), an EFC time, and his best estimate of any additional en route/terminal delay.

1.4.5.2 If the holding pattern is charted and the controller doesn't issue complete holding instructions, the pilot is expected to hold as depicted on the appropriate chart. When the pattern is charted, the controller may omit all holding instructions except the charted holding direction and the statement "AS PUBLISHED;" e.g., "HOLD EAST AS PUBLISHED." Controllers shall always issue complete holding instructions when pilots request them.

Note. — Only those holding patterns depicted on U.S. Government or commercially produced (meeting FAA requirements) low/high altitude enroute, and area or STAR charts should be used.

1.4.5.3 If no holding pattern is charted and holding instructions have not been issued, the pilot should ask ATC for holding instructions prior to reaching the fix. This procedure will eliminate the possibility of an aircraft entering a holding pattern other than that desired by ATC. If the pilot is unable to obtain holding instructions prior to reaching the fix (due to frequency congestion, stuck microphones, etc.), he should hold in a standard pattern on the course on which he approached the fix and request further clearance as soon as possible. In this event, the altitude/flight level of the aircraft at the clearance limit will be protected so that separation will be provided as required.

1.4.5.4 When an aircraft is 3 minutes or less from a clearance limit and a clearance beyond the fix has not been received, the pilot is expected to start a speed reduction so that he will cross the fix, initially, at or below the maximum holding airspeed.

1.4.5.5 When no delay is expected, the controller should issue a clearance beyond the fix as soon as possible and, whenever possible, at least 5 minutes before the aircraft reaches the clearance limit.

1.4.5.6 Pilots should report to ATC the time and altitude/flight level at which the aircraft reaches the clearance limit and report leaving the clearance limit.

Note. — In the event of two-way communications failure, pilots are required to comply with FAR 91.185.

1.5 Amended Clearance

1.5.1 Amendments to the initial clearance will be issued at any time an air traffic controller deems such action necessary to avoid possible confliction between aircraft. Clearances will require that a flight "hold" or change altitude prior to reaching the point where standard separation from other IFR traffic would no longer exist. Some pilots have questioned this action and requested "traffic information" and were at a loss when the reply indicated "no traffic reported." In such cases the controller has taken action to prevent a traffic confliction which would have occurred at a distant point.

1.5.2 A pilot may wish an explanation of the handling of his flight at the time of occurrence; however, controllers are not able to take time from their immediate control duties nor can they afford to overload the ATC communications channels to furnish explanations. Pilots may obtain an explanation by directing a letter or telephone call to the chief controller of the facility involved.

1.5.3 The pilot has the privilege of requesting a different clearance from that which has been issued by ATC if he feels that he has information which would make another course of action more practicable or if aircraft equipment limitations or company procedures forbid compliance with the clearance issued.

1.5.4 Pilots should pay particular attention to the clearance and not assume that the route and altitude/flight level are the same as requested in the flight plan. It is suggested that pilots make a written report of clearances at the time they are received, and verify, by a repeat back, any portions that are complex or about which a doubt exists. It will be the responsibility of each pilot to accept or refuse the clearance issued.

1.6 Special VFR Clearance

1.6.1 An ATC clearance must be obtained *prior* to operating within Class B, C, D and E surface areas when the weather is less than that required for VFR flight. A VFR pilot may request and be given a clearance to enter, leave or operate within most Class D and E surface areas and some Class B and C surface areas in special VFR conditions, traffic permitting, and providing such flight will not delay IFR operations. All special VFR flights must remain clear of clouds. The visibility requirements for Special VFR aircraft (other than helicopters) are:

1.6.1.1 At least one statute mile flight visibility for operations within Class B, C, D and E surface areas.

1.6.1.2 At least one statute mile ground visibility if taking off or landing. If ground visibility is not reported at that airport, the flight visibility must be at least one statute mile.

1.6.1.3 The restriction in (1) and (2) do not apply to helicopters. Helicopters must remain clear of clouds and may operate in Class B, C, D and E surface areas with less than one statute mile visibility.

1.6.2 When a control tower is located within Class B, C and D surface areas, requests for clearances should be to the tower. If no tower is located within the surface area, a clearance may be obtained from the nearest tower, flight service station or center.

1.6.3 It is not necessary to file a complete flight plan with the request for clearance but the pilot should state his intentions in sufficient detail to permit air traffic control to fit his flight into the traffic flow. The clearance will not contain a specific altitude as the pilot must remain clear of clouds. The controller may require the pilot to fly at or below a certain altitude due to other traffic, but the altitude specified will permit flight at or above the minimum safe altitude. In addition, at radar locations, flight may be vectored if necessary for control purposes or on pilot request.

Note. — The pilot is responsible for obstacle or terrain clearance (reference FAR 91.119).

1.6.4 Special VFR clearances are effective within Class B, C, D and E surface areas only. ATC does not provide separation after an aircraft leaves Class D surface area on a special VFR clearance.

1.6.5 Special VFR operations by fixed-wing aircraft are prohibited in some Class B and C surface areas due to the volume of IFR traffic. A list of these Class B and C surface areas is contained in FAR Part 91, Appendix D, Section 3 and also depicted on Sectional Aeronautical Charts.

1.6.6 ATC provides separation between special VFR flights and between them and other IFR flights.

1.6.7 Special VFR operations by fixed-wing aircraft are prohibited between sunset and sunrise unless the pilot is instrument rated and the aircraft is equipped for IFR flight.

1.7 Clearance Prefix

A clearance, information, or request for information originated by an ATC facility and relayed to the pilot through an air/ground communication station will be prefixed by "ATC CLEARS," "ATC ADVISES," or "ATC REQUESTS."

6.8.1.4 Do not expect to receive radar traffic advisories on all traffic. Some aircraft may not appear on the radar display. Be aware that the controller may be occupied with high priority duties and unable to issue traffic information for a variety of reasons.

6.8.1.5 Advise controller if service not desired.

6.8.2 Controller

6.8.2.1 Issues radar traffic to the maximum extent consistent with higher priority duties except in Class A airspace.

6.8.2.2 Provides vectors to assist aircraft to avoid observed traffic when requested by the pilot.

6.8.2.3 Issues traffic information to aircraft in Class D airspace for sequencing purposes

6.9 Safety Alert

6.9.1 Pilot

6.9.1.1 Initiate appropriate action if a safety alert is received from ATC.

6.9.1.2 Be aware that this service is not always available and that many factors affect the ability of the controller to be aware of a situation in which unsafe proximity to terrain, obstructions, or another aircraft may be developing.

6.9.2 Controller

6.9.2.1 Issues a safety alert if he is aware an aircraft under his control is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain, obstructions or another aircraft. Types of safety alerts are:

6.9.2.1.1 Terrain/Obstruction Alerts—Immediately issued to an aircraft under his control if he is aware the aircraft is at an altitude believed to place the aircraft in unsafe proximity to terrain/ obstruction.

6.9.2.1.2 Aircraft Conflict Alerts—Immediately issued to an aircraft under his control if he is aware of an aircraft not under his control at an altitude believed to place the aircraft in unsafe proximity to each other. With the alert, he offers the pilot an alternative if feasible.

6.9.2.2 Discontinues further alerts if informed by the pilot that he is taking action to correct the situation or that he has the other aircraft in sight.

6.10 See and Avoid

6.10.1 Pilot

6.10.1.1 When meteorological conditions permit, regardless of type of flight plan or whether or not under control of an radar facility, the pilot is responsible to see and avoid other traffic, terrain, or obstacles.

6.10.2 Controller

6.10.2.1 Provides radar traffic information to radar identified aircraft operating outside positive control airspace on a workload permitting basis.

6.10.2.2 Issues a safety advisory to an aircraft under his control if he is aware the aircraft is at an altitude believed to place the aircraft in unsafe proximity to terrain, obstructions or other aircraft.

6.11 Visual Approach

6.11.1 Pilot

6.11.1.1 If a visual approach is not desired, advise ATC

6.11.1.2 Comply with controller's instructions for vectors toward the airport of intended landing or to a visual position behind a preceding aircraft.

6.11.1.3 The pilot must, at all times, have either the airport or the preceding aircraft in sight. After being cleared for a visual approach, proceed to the airport in a normal manner or follow the preceding aircraft. Remain clear of clouds while conducting a visual approach.

6.11.1.4 If the pilot accepts a visual approach clearance to visually follow a preceding aircraft, you are required to establish a safe landing interval behind the aircraft you were instructed to follow. You are responsible for wake turbulence separation.

6.11.1.5 Advise ATC immediately if the pilot is unable to continue following the preceding aircraft, cannot remain clear of clouds, or lose sight of the airport.

6.11.1.6 Be aware that radar service is automatically terminated, without being advised by ATC, when the pilot is instructed to change to advisory frequency.

6.11.1.7 Be aware that there may be other traffic in traffic pattern and the landing sequence may differ from the traffic sequence assigned by the approach control or air route traffic control center.

6.11.2 Controller

6.11.2.1 Do not clear an aircraft for a visual approach unless reported weather at the airport is ceiling at or above 1,000 feet and visibility is 3 miles or greater. When weather is not available for the destination airport, inform the pilot and do not initiate a visual approach to that airport unless there is reasonable assurance that descent and flight to the airport can be made in VFR conditions.

6.11.2.2 Issue visual approach clearance when the pilot reports sighting either the airport or a preceding aircraft which is to be followed.

6.11.2.3 Provide separation except when visual separation is being applied by the pilot.

6.11.2.4 Continue flight following and traffic information until the aircraft has landed or has been instructed to change to advisory frequency.

6.11.2.5 Inform the pilot when the preceding aircraft is a heavy.

6.11.2.6 When weather is available for the destination airport, do not initiate a vector for a visual approach unless the reported ceiling at the airport is 500 feet or more above the MVA and visibility is 3 miles or more. If vectoring weather minima are not available but weather at the airport is ceiling at or above 1,000 feet and visibility of 3 miles or greater, visual approaches may still be conducted.

6.11.2.7 Informs the pilot conducting the visual approach of the aircraft class when pertinent traffic is known to be a heavy aircraft.

6.12 Visual Separation

6.12.1 Pilot

6.12.1.1 Acceptance of instructions to follow another aircraft or to provide visual separation from it is an acknowledgment that the pilot will maneuver his/her aircraft as necessary to avoid the other aircraft or to maintain intrail separation.

6.12.1.2 If instructed by ATC to follow another aircraft or to provide visual separation from it, promptly notify the controller if you lose sight of that aircraft, are unable to maintain continued visual contact with it, or cannot accept the responsibility for your own separation for any reason.

6.12.1.3 The pilot also accepts responsibility for wake turbulence separation under these conditions.

6.12.2 Controller

6.12.2.1 Applies visual separation only:

6.12.2.1.1 In conjunction with visual approaches.

6.12.2.1.2 Within the terminal area when a controller has both aircraft in sight or by instructing a pilot who sees the other aircraft to maintain visual separation from it.

6.12.2.1.3 Within en route airspace when aircraft are on opposite courses and one pilot reports having seen the other aircraft and that the aircraft have passed each other.

6.13 VFR-ON-TOP

6.13.1 Pilot

6.13.1.1 This clearance must be requested by the pilot on an IFR flight plan and if approved, permits the pilot to select an altitude or flight level of his choice (subject to any ATC restrictions) in lieu of an assigned altitude.

Note 1. — VFR-ON-TOP is not permitted in certain airspace areas, such as positive control airspace, certain restricted areas, etc. Consequently, IFR flights operating VFR-ON-TOP will avoid such airspace.

Note 2. — See related AIP paragraphs, RAC 3.4;3.2, Rules Pertaining to IFR Aircraft in Class A, B, C, D and E airspace; RAC 3.3;4, IFR Clearance VFR-ON-TOP; RAC 3.3;5.3, IFR Separation Standards; RAC 3.5;4, Position Reporting; and RAC 3.5;5, Additional Reports.

6.13.1.2 By requesting a VFR-ON-TOP clearance, the pilot indicates that he is assuming the sole responsibility to be vigilant so as to see and avoid other aircraft and that he will:

6.13.1.2.1 Fly at the appropriate VFR altitude as prescribed in FAR 91.159.

6.13.1.2.2 Comply with the VFR visibility and distance from criteria in FAR 91.155 (Basic VFR Weather Minimums).

6.13.1.2.3 Comply with instrument flight rules that are applicable to this flight; i.e., minimum IFR altitudes, position reporting, radio communications, course to be flown, adherence to ATC clearance, etc.

6.13.1.3 Should advise ATC prior to any altitude change to ensure the exchange of accurate traffic infoemation.

6.13.2 Controller

6.13.2.1 May clear an aircraft to maintain VFR-ON-TOP if the pilot of an aircraft on an IFR flight plan requests the clearance.

6.13.2.2 Inform the pilot of an aircraft cleared to climb to VFR-ON-TOP: the reported height of the tops or that no top report is available, issues an alternate clearance if necessary, and once the aircraft reports reaching VFR-ON-TOP, reclears the aircraft to maintain VFR-ON-TOP.

6.13.2.3 Before issuing clearance, ascertains that the aircraft is not in or will not enter positive control airspace.

6.14 Instrument Departures

6.14.1 Pilot

6.14.1.1 Prior to Departure,: consider the type of terrain and other obstructions on or in the vicinity of the departure airport.

6.14.1.2 Determine if obstruction avoidance can be maintained visually or that the departure procedure should be followed.

6.14.1.3 Determine whether a departure procedure and/or Standard Instrument Departure (SID) is available for obstruction avoidance.

6.14.1.4 At airports where instrument approach procedures have not been published, hence no published departure procedure, determine what action will be necessary and take such action that will assure a safe departure.

6.14.2 Controller

6.14.2.1 At locations with airport traffic control service, when necessary, specifies direction of takeoff/turn or initial heading to be flown after takeoff.

6.14.2.2 At locations without airport traffic control service but within Class E surface area, when necessary to specify direction of takeoff/turn or initial heading to be flown, obtains pilot's concurrence that the procedure will allow him to comply with local traffic patterns, terrain, and obstruction avoidance.

6.14.2.3 Includes established departure procedures as part of the air traffic control clearance when pilot compliance is necessary to ensure separation.

6.15 Minimum Fuel Advisory.

6.15.1 Pilot

6.15.1.1 Advise ATC of your "minimum fuel" status when your fuel supply has reached a state where, upon reaching destination, you cannot accept any undue delay.

6.15.1.2 Be aware that this is not an emergency situation but merely an advisory that indicates an emergency situation is possible should any undue delay occur.

6.15.1.3 On initial contact the term "minimum fuel" should Be used after stating call sign.

Examples:

SALT LAKE APPROACH, UNITED 621, "MINIMUM FUEL"

6.15.1.4 Be aware a minimum fuel advisory does not imply a need for traffic priority.

6.15.1.5 If the remaining usable fuel supply suggests the need for traffic priority to ensure a safe landing, you should declare an emergency account low fuel, and report the fuel remaining in minutes.

6.15.2 Controller

6.15.2.1 When an aircraft declares a state of "minimum fuel," relay this information to the facility to whom control jurisdiction is transferred.

6.15.2.2 Be alert for any occurrence which might delay the aircraft.

7. TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS I & II)

7.1 TCAS I provides proximity warning only, to assist the pilot in the visual acquisition of intruder aircraft. No recommended avoidance maneuvers are provided nor authorized as a direct result of a TCAS I warning. It is intended for use by smaller commuter aircraft holding 10 to 30 passenger seats, and general aviation aircraft.

7.2 TCAS II provides traffic advisories (TA's) and resolution advisories (RA's). Resolution advisories provide recommended maneuvers in a vertical direction (climb or descend only) to avoid conflicting traffic. Airline aircraft, and larger commuter and business aircraft holding 31 passenger seats or more, use TCAS II equipment.

7.2.1 Each pilot who deviates from an ATC clearance in response to a TCAS II RA shall notify ATC of that deviation as soon as practicable and expeditiously return to the current ATC clearance when the traffic conflict is resolved.

7.2.2 Deviations from rules, policies, or clearances should be kept to the minimum necessary to satisfy a TCAS II RA.

7.2.3 The serving IFR air traffic facility is not responsible to provide approved standard IFR separation to an aircraft after a TCAS II RA maneuver until one of the following conditions exists:

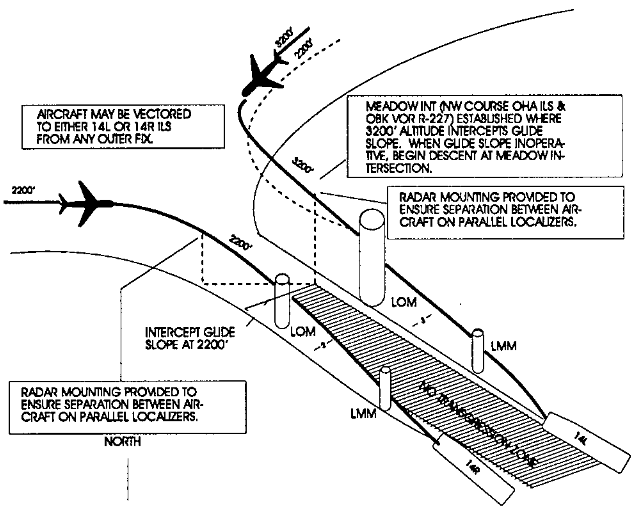
7.2.3.1 The aircraft has returned to its assigned altitude and course.

7.2.3.2 Alternate ATC instructions have been issued.

7.3 TCAS does not alter or diminish the pilot's basic authority and responsibility to ensure safe flight. Since TCAS does not respond to aircraft which are not transponder equipped or aircraft with a transponder failure, TCAS alone does not ensure safe separation in every case.

7.4 At this time, no air traffic service nor handling is predicated on the availability of TCAS equipment in the aircraft.

3.13.2.3 Simultaneous ILS Approach Graphic



3.13.3 Parallel ILS/MLS Approaches

3.13.3.1 Parallel approaches are an air traffic control procedure permitting parallel ILS, MLS, or ILS and MLS approaches to airports having parallel runways separated by at least 2,500 feet between centerlines. Integral parts of a total system are ILS or MLS, radar, communications, ATC procedures, and appropriate airborne equipment.

3.13.3.2 A parallel approach differs from a simultaneous approach in that the minimum distance between parallel runway centerlines is reduced; there is no requirement for radar monitoring or advisories; and, a staggered separation of aircraft on the adjacent localizer course is required.

3.13.3.3 Aircraft are afforded a minimum of 2 miles radar separation between successive aircraft on the adjacent localizer course and a minimum of 3 miles radar separation from aircraft on the same localizer course. In addition, a minimum of 1,000 feet vertical or a minimum of 3 miles radar separation is provided between aircraft during turn-on.

3.13.3.4 Whenever parallel approaches are in progress, aircraft are informed that approaches to both runways are in use. In addition, the radar controller will have the interphone capability of communicating directly with the tower controller where the responsibility for radar separation is not performed by the tower controller.

3.13.4 Simultaneous Converging Instrument Approaches

3.13.4.1 ATC may conduct instrument approaches simultaneously to converging runways; i.e., runways having an included angle from 15 to 100 degrees, at airports where a program has been specifically approved to do so.

3.13.4.2 The basic concept requires that dedicated, separate standard instrument approach procedures be developed for each converging runway included. Missed approach points must be as least 3 miles apart and missed approach procedures ensure that missed approach protected airspace does not overlap.

3.13.4.3 Other requirements are: radar availability, nonintersecting final approach courses, precision (ILS/MLS) approach systems on each runway, and if runways intersect, controllers must be able to apply visual separation as well as intersecting runway separation criteria. Intersecting runways also require minimums of at least 700 and 2. Straight in approaches and landings must be made.

3.13.4.4 Whenever simultaneous converging approaches are in progress, aircraft will be informed by the controller as soon as feasible after initial contact or via ATIS. Additionally, the radar controller will have direct communications capability with the tower controller where separation responsibility has not been delegated to the tower.

3.14 Timed Approaches From a Holding Fix

3.14.1 Timed approaches may be conducted when the following conditions are met:

(1) A control tower is in operation at the airport where the approaches are conducted.

(2) Direct communications is maintained between the pilot and the center/approach controller until the pilot is instructed to contact the tower.

(3) If more than one missed approach procedure is available, none require a course reversal.

(4) If only one missed approach procedure is available, the following conditions are met:

(a) Course reversal is not required; and,

(b) Reported ceiling and visibility are equal to or greater than the highest prescribed circling minimums for the instrument approach procedure.

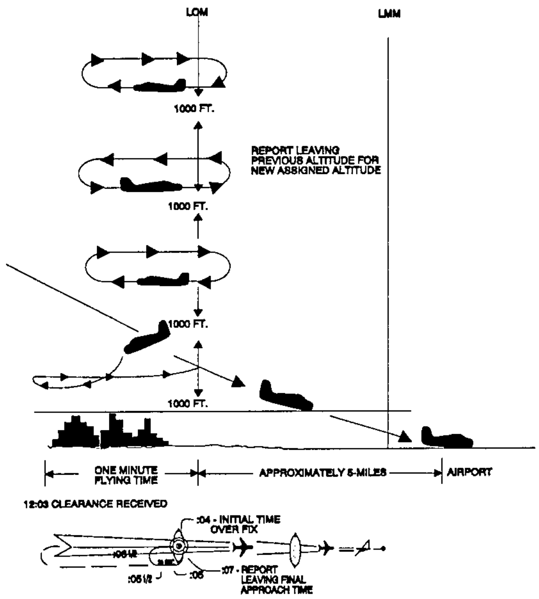
(5) When cleared for the approach, pilots shall not execute a procedure turn. (Ref: FAR 91.175j)

3.14.2 Although the controller will not specifically state that "timed approaches are in progress," his assigning a time to depart the final approach fix inbound (non-precision approach) or the outer marker or the fix used in lieu of the outer marker inbound (precision approach) is indicative that timed approach procedures are being utilized, or in lieu of holding, he may use radar vectors to the final approach course to establish a mileage interval between aircraft that will insure the appropriate time sequence between the final approach fix/outer marker or the fix used in lieu of the outer marker and the airport.

3.14.3 Each pilot in an approach sequence will be given advance notice as to the time he should leave the holding point on approach to the airport. When a time to leave the holding point has been received, the pilot should adjust his flight path to leave the fix as closely as possible to the designated time.

3.14.4 Timed Approach Example

The following figure depicts a final approach procedure from a holding pattern at a final approach fix (FAF). At 12:03 local time, in the example shown, a pilot holding, receives instructions to leave the fix inbound at 12:07. These instructions are received just as the pilot has completed turn at the outbound end of the holding pattern and is proceeding inbound towards the fix. Arriving back over the fix, the pilot notes that the time is 12:04 and that he has three minutes to lose in order to leave the fix at the assigned time. Since the time remaining is more than two minutes, the pilot plans to fly a race track pattern rather than a 360° turn, which would use up two minutes. The turns at the ends of the race track pattern will consume approximately two minutes. Three minutes to go, minus two minutes required for turns, leaves one minute for level flight. Since two portions of level flight will be required to get back to the fix inbound, the pilot halves the one minute remaining and plans to fly level for 30 seconds outbound before starting his turn back toward the fix on final approach. If the winds were negligible at flight altitude, this procedure would bring the pilot inbound across the fix precisely at the specified time of 12:07. However, if the pilot expected a headwind on final approach, he should shorten his 30 seconds outbound course somewhat, knowing that the wind will carry him away from the fix faster while outbound and decrease his ground speed while returning to the fix. On the other hand, if the pilot knew he would have a tailwind on final approach, should length his calculated 30-second outbound heading somewhat, knowing the wind would tend to hold him closer to the fix while outbound and increase his ground speed while returning to the fix.



At 12:03 local time, in the example shown, a pilot holding, receives instructions to leave These instructions are received just as the pilot has completed turn at the outbound end of the holding pattern and is proceeding inbound towards the fix. Arriving back over the fix, the pilot notes that the time is 12:04 and that he has 3 minutes to lose in order to leave the fix at the assigned time. Since the time remaining is more than 2 minutes, the pilot plans to fly a race track pattern rather than a 360 degrees turn, which would use up 2 minutes. The turns at the ends of the race track pattern will consume approximately 2 minutes. Three minutes to go, minus 2 minutes required for turns, leaves 1 minute for level flight. Since two portions of level altitude, this procedure would bring the pilot inbound across flight will be required to get back to the fix inbound, the pilot halves the 1 minute remaining and plans to fly level for 30 seconds outbound before starting his turn back toward the fix on final approach. If the winds were negligible at flight the fix precisely at the specified time of 12:07. However, if the pilot expected a headwind on final approach, he should shorten his 30 seconds outbound course somewhat, knowing that the wind will carry him away from the fix faster and decrease his ground speed while returning to the fix. On the other hand, if the pilot knew he would have a tailwind on final approach, he should lengthen his calculated 30-second outbound heading somewhat, knowing that the wind would tend to hold him closer to the fix while outbound and increase his

3.15 Contact Approaches

3.15.1 Pilots operating in accordance with an IFR flight plan, provided they are clear of clouds and have at least 1 mile flight visibility and can reasonably expect to continue to the destination airport in those conditions, may request ATC authorization for a "contact approach."

3.15.2 Controllers may authorize a "contact approach" provided:

(1) The Contact Approach is specifically requested by the pilot. ATC cannot initiate this approach.

Example:

REQUEST CONTACT APPROACH

(2) The reported ground visibility at the destination airport is at least 1 statute mile.

(3) The contact approach will be made to an airport having a standard or special instrument approach procedure.

(4) Approved separation is applied between aircraft so cleared and between these aircraft and other IFR or special VFR aircraft.

Example:

CLEARED CONTACT APPROACH (and if required) AT OR BELOW (altitude) (routing) IF NOT POSSIBLE (alternative procedures) AND ADVISE.

3.15.3 A Contact Approach is an approach procedure that may be used by a pilot (with prior authorization from ATC) in lieu of conducting a standard or special instrument approach procedure to an airport. It is not intended for use by a pilot on an IFR flight clearance to operate to an airport not having an authorized instrument approach procedure. Nor is it intended for an aircraft to conduct an instrument approach to one airport and then, when "in the clear," to discontinue that approach and proceed to another airport. In the execution of a contact approach, the pilot assumes the responsibility for obstruction clearance. If radar service is received, it will automatically terminate when the pilot is told to contact the tower.

3.16 Visual Approaches

3.16.1 A visual approach is conducted on an IFR flight plan and authorizes a pilot to proceed visually to the airport. The pilot must have either the airport or the preceding identified aircraft in sight. This approach must be authorized and controlled by the appropriate air traffic control facility. Reported weather at the airport must have a ceiling at or above 1,000 feet and visibility 3 miles or greater. ATC may authorize this type approach when it will be operationally beneficial. Compliance with FAR 91.155 is not required.

3.16.2 OPERATING TO AN AIRPORT WITHOUT WEATHER REPORTING SERVICE: ATC will advise the pilot when weather is not available at the destination airport. ATC may initiate a visual approach provided there is a reasonable assurance that weather at the airport is a ceiling at or above 1,000 feet and visibility 3 miles or greater (e.g. area weather reports, PIREPS, etc.).

3.16.3 OPERATING TO AN AIRPORT WITH AN OPERATING CONTROL TOWER: Aircraft may be authorized to conduct a visual approach to one runway while other aircraft are conducting IFR or VFR approaches to another parallel, intersecting, or converging runway. When operating to airports with parallel runways separated by less than 2,500 feet, the succeeding aircraft must report sighting the preceding aircraft unless standard separation is being provided by ATC. When operating to parallel runways separated by at least 2,500 feet but less than 4,300 feet, controllers will clear/vector aircraft to the final at an angle not greater than 30 degrees unless radar, vertical, or visual separation is provided during the turn-on. The purpose of the 30 degree intercept angle is to reduce the potential for overshoots of the final and to preclude side-by-side operations with one or both aircraft in a belly-up configuration during the turn-on. Once the aircraft are established within 30 degrees of final, or on the final, these operations may be conducted simultaneously. When the parallel runways are separated by 4,300 feet or more, or intersecting/converging runways are in use, ATC may authorize a visual approach after advising all aircraft involved that other aircraft are conducting operations to the other runway. This may be accomplished through use of the ATIS.

3.16.4 SEPARATION RESPONSIBILITIES: If the pilot has the airport in sight but cannot see the aircraft he is following, ATC may clear the aircraft for a visual approach; however, ATC retains both separation and wake vortex separation responsibility. When visually following a preceding aircraft, acceptance of the visual approach clearance constitutes acceptance of pilot responsibility for maintaining a safe approach interval and adequate wake turbulence separation. e. A visual approach is not an IAP and therefore has no missed approach segment. If a go around is necessary for any reason, aircraft operating at controlled airports will be issued an appropriate advisory/clearance/instruction by the tower. At uncontrolled airports, aircraft are expected to remain in VFR conditions and complete a landing as soon as possible. If a landing cannot be accomplished, the aircraft is expected to remain in VFR conditions and contact ATC as soon as possible for further clearance. Separation from other IFR aircraft will be maintained under these circumstances.

3.16.5 A visual approach is not an IAP and therefore has no missed approach segment. If a go around is necessary for any reason, aircraft operating at controlled airports will be issued an appropriate advisory/clearance/instruction by the tower. At uncontrolled airports, aircraft are expected to remain clear of clouds and complete a landing as soon as possible. If a landing cannot be accomplished, the aircraft is expected to remain clear of clouds and contact ATC as soon as possible for further clearance. Separation from other IFR aircraft will be maintained under these circumstances.

3.16.6 Visual approaches reduce pilot/controller workload and expedite traffic by shortening flight paths to the airport. It is the pilot's responsibility to advise ATC as soon as possible if a visual approach is not desired.

3.16.7 Authorization to conduct a visual approach is an IFR authorization and does not alter IFR flight plan cancellation responsibility.(Reference—Canceling IFR Flight Plan, paragraph 5.2).

3.16.8 Radar service is automatically terminated, without advising the pilot, when the aircraft is instructed to change to advisory frequency.

3.17 Charted Visual Flight Procedures (CVFP's)

3.17.1 CVFP's are charted visual approaches established at locations with jet operations for noise abatement purposes. The approach charts depict prominent landmarks, courses, and recommended altitudes to specific runways.

3.17.2 These procedures will be used only in a radar environment at airports with an operating control tower.

3.17.3 Most approach charts will depict some NAVAID information which is for supplemental navigational guidance only.

3.17.4 Unless indicating a Class B Airspace floor, all depicted altitudes are for noise abatement purposes and are recommended only. Pilots are not prohibited from flying other than recommended altitudes if operational requirements dictate.

3.17.5 When landmarks used for navigation are not visible at night, the approach will be annotated "PROCEDURE NOT AUTHORIZED AT NIGHT."

3.17.6 CVFP's usually begin within 15 flying miles from the airport.

3.17.7 Published weather minimums for CVFP's are based on minimum vectoring altitudes rather than the recommended altitudes depicted on charts.

3.17.8 CVFP's are not instrument approaches and do not have missed approach segments.

3.17.9 ATC will not issue clearances for CVFP's when the weather is less than the published minimum.

3.17.10 ATC will clear aircraft for a CVFP after the pilot reports siting a charted landmark or a preceding aircraft. If instructed to follow a preceding aircraft, pilots are responsible for maintaining a safe approach interval and wake turbulence separation.

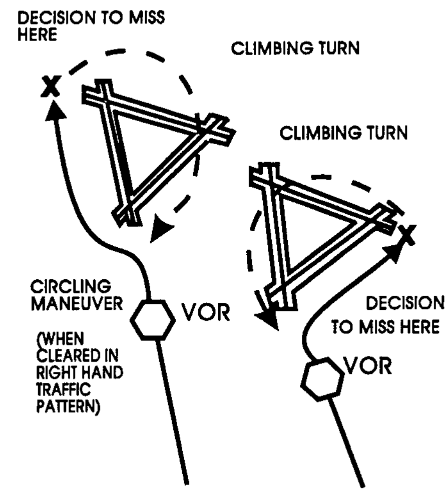
3.17.11 Pilots should advise ATC if at any point they are unable to continue an approach or lose sight of a preceding aircraft. Missed approaches will be handled as a go-around.

3.18 Missed Approach

3.18.1 When a landing cannot be accomplished, advise ATC and, upon reaching the missed approach point defined on the approach procedure chart, the pilot must comply with the missed approach instructions for the procedure being used or with an alternate missed approach procedure specified by Air Traffic Control.

3.18.2 Protected obstacle clearance areas for missed approach are predicated on the assumption that the abort is initiated at the missed approach point not lower than the Minimum Descent Altitude (MDA) or Decision Height maneuvers. However, no consideration is given to an abnormally early turn. Therefore, when an early missed approach is executed, pilots should, unless otherwise cleared by ATC, fly the instrument approach procedure as specified on the approach plate to the missed approach point at or above the MDA or DH before executing a turning maneuver.

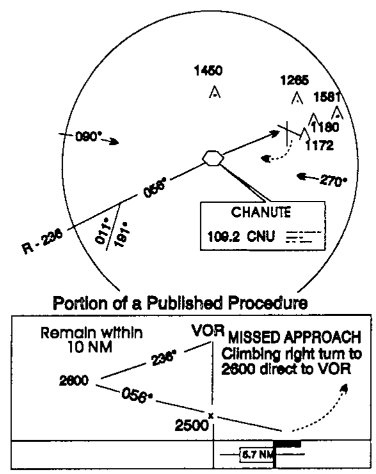
3.18.3 If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that particular procedure must be followed (unless an alternate missed approach procedure is specified by Air Traffic control). To become established on the prescribed missed approach course, the pilot should make an initial climbing turn toward the landing runway and continue the turn until he is established on the missed approach course. Inasmuch as the circling maneuver may be accomplished in more than one direction, different patters will be required to become established on the prescribed missed approach course depending on the aircraft position at the time visual reference is lost. Adherence to the procedure, illustrated below, will assure that an aircraft will remain within the circling and missed approach obstruction clearance areas.



3.18.4 At locations where ATC Radar Service is provided the pilot should conform to radar vectors when provided by ATC in lieu of the published missed approach procedure.

3.18.5 Missed Approach Procedure Example

Missed Approach - Example



3.18.6 When the approach has been missed, request a clearance for specific action; i.e., to alternative airport, another approach, etc.

3.19 Overhead Approach Maneuver

3.19.1 Pilots operating in accordance with an instrument flight rules (IFR) flight plan in visual meteorological conditions

(VMC) may request Air Traffic Control (ATC) authorization for an overhead maneuver. An overhead maneuver is not an instrument approach procedure. Overhead maneuver patterns are developed at airports where aircraft have an operational need to conduct the maneuver. An aircraft conducting an overhead maneuver is considered to be visual flight rules (VFR) and the IFR flight plan is cancelled when the aircraft crosses the landing threshold on the initial approach portion of the maneuver. The existence of a standard overhead maneuver pattern does not eliminate the possible requirement for an aircraft to conform to conventional rectangular patterns if an overhead maneuver cannot be approved. Aircraft operating to an airport without a functioning control tower must initiate cancellation of an IFR flight plan prior to executing the overhead maneuver. Cancellation of the IFR flight plan must be accomplished after crossing the landing threshold on the initial portion of the maneuver or after landing. Controllers may authorize an overhead maneuver and issue the following to arriving aircraft:

3.19.1.1 Pattern altitude and direction of traffic. This information may be omitted if either is standard.

PHRASEOLOGY:

PATTERN ALTITUDE (altitude). RIGHT TURNS.

3.19.1.2 Request for a report on initial approach.

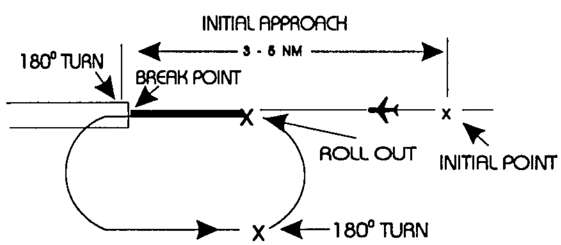
PHRASEOLOGY:

REPORT INITIAL.

3.19.1.3 ''Break'' information and a request for the pilot to report. The ''Break Point'' will be specified if non-standard. Pilots may be requested to report ''break'' if required for traffic or other reasons.

PHRASEOLOGY:

BREAK AT (Specified point).
REPORT BREAK.



4. DEPARTURE PROCEDURES

4.1 Pre-Taxi Clearance Procedures

4.1.1 Certain airports have established programs whereby pilots of departing IFR aircraft may elect to receive their IFR clearances before they start taxiing for takeoff. The following provisions are included in such procedures:

(1) Pilot participation is not mandatory.

(2) Participating pilots call clearance delivery/ground control not more than 10 minutes before proposed taxi time.

(3) IFR clearance (or delay information, if clearance cannot be obtained) is issued at the time of this initial call-up.

(4) When the IFR clearance is received on clearance delivery frequency, pilots call ground control when ready to taxi.

(5) Normally, pilots need not inform ground control that they have received IFR clearance on clearance delivery frequency. Certain locations may, however, require that the pilot inform ground control of a portion of his routing or that he has received his IFR clearance.

(6) If a pilot cannot establish contact on clearance delivery frequency or has not received his IFR clearance before he is ready to taxi, he contacts ground control and informs the controller accordingly.

4.1.2 Locations where these procedures are in effect are indicated in the Airport/Facility Directory.

4.2 Taxi Clearance

Pilots on IFR flight plans should communicate with the control tower on the appropriate ground control/clearance delivery frequency prior to starting engines to receive engine start time, taxi, and/or clearance information.

4.3 Departure Restrictions, Clearance Void Times, Hold for Release, and Release Times

4.3.1 ATC may assign departure restrictions, clearance void times, hold for release, and release times, when necessary, to separate departures from other traffic or to restrict or regulate the departure flow.

4.3.1.1 Clearance Void Times—A pilot may receive a clearance, when operating from an airport without a control tower, which contains a provision for the clearance to be void if not airborne by a specific time. A pilot who does not depart prior to the clearance void time must advise ATC as soon as possible of his or her intentions. ATC will normally advise the pilot of the time allotted to notify ATC that the aircraft did not depart prior to the clearance void time. This time cannot exceed 30 minutes. Failure of an aircraft to contact ATC within 30 minutes after the clearance void time will result in the aircraft being considered overdue and search and rescue procedures initiated.

NOTE 1.-Other IFR traffic for the airport where the clearance is issued is suspended until the aircraft has contacted ATC or until 30 minutes after the clearance void time or 30 minutes after the clearance release time if no clearance void time is issued.

NOTE 2.—Pilots who depart at or after their clearance void time are not afforded IFR separation and may be in violation of FAR 91.173 which requires that pilots receive an appropriate ATC clearance before operating IFR in Class A, B, C, D and E Airspace.

EXAMPLE:

CLEARANCE VOID IF NOT OFF BY (clearance void time) and, if required, IF NOT OFF BY (clearance void time) ADVISE (facility) NOT LATER THAN (time) OF INTENTIONS.

4.3.1.2 Hold for Release—ATC may issue ''hold for release'' instructions in a clearance to delay an aircraft's departure for traffic management reasons (i.e., weather, traffic volume, etc.). When ATC states in the clearance, ''hold for release,'' the pilot may not depart utilizing that instrument flight rules (IFR) clearance until a release time or additional instructions are issued by ATC. This does not preclude the pilot from cancelling the IFR clearance with ATC and departing under visual flight rules (VFR); but an IFR clearance may not be available after departure. In addition, ATC will include departure delay information in conjunction with ''hold for release'' instructions.

EXAMPLE:

(Aircraft identification) CLEARED TO (destination) AIRPORT AS FILED, MAINTAIN (altitude), and, if required (additional instructions or information), HOLD FOR RELEASE, EXPECT (time in hours and/or minutes) DEPARTURE DELAY.

4.3.1.3 Release Times—A "release time" is a departure restriction issued to a pilot by ATC, specifying the earliest time an aircraft may depart. ATC will use "release times" in conjunction with traffic management procedures and/or to separate a departing aircraft from other traffic.

EXAMPLE:

(Aircraft identification) RELEASED FOR DEPARTURE AT (time in hours and/or minutes).

4.3.2 If practical, pilots departing uncontrolled airports should obtain IFR clearances prior to becoming airborne when two way communications with the controlling ATC facility is available.

4.4 Departure Control

4.4.1 Departure Control is an approach control function responsible for ensuring separation between departures. So as to expedite the handling of departures, Departure Control may suggest a takeoff direction other than that which may normally have been used under VFR handling. Many times it is preferred to offer the pilot a runway that will require the fewest turns after takeoff to place the pilot on his filed course or selected departure route as quickly as possible. At many locations particular attention is paid to the use of preferential runways for local noise abatement programs, and route departures away from congested areas.

4.4.2 Departure Control utilizing radar will normally clear aircraft out of the terminal area using standard instrument departures (SID) via radio navigation aids. When a departure is to be vectored immediately following takeoff, the pilot will be advised prior to takeoff of the initial heading to be flown but may not be advised of the purpose of the heading. Pilots operating in a radar environment are expected to associate departure headings with vectors to their planned route of flight. When given a vector taking his aircraft off a previously assigned nonradar route, the pilot will be advised briefly what the vector is to achieve. Thereafter, radar service will be provided until the aircraft has been reestablished "on-course" using an appropriate navigation aid and the pilot has been advised of his position; or, a handoff is made to another radar controller with further surveillance capabilities.

4.4.3 Controllers will inform pilots of the departure control frequencies and, if appropriate, the transponder code before takeoff. Pilots should not operate their transponder until ready to start the takeoff roll or change to the departure control frequency until requested. Controllers may omit the departure control frequency if a SID has or will be assigned and the departure control frequency is published on the SID.

4.5 Abbreviated IFR Departure Clearance (Cleared . . . as Filed) Procedures

4.5.1 ATC facilities will issue an abbreviated IFR departure clearance based on the ROUTE of flight filed in the IFR flight plan, provided the filed route can be approved with little or no revision. These abbreviated clearance procedures are based on the following conditions:

(1) The aircraft is on the ground or it has departed VFR and the pilot is requesting IFR clearance while airborne.

(2) That a pilot will not accept an abbreviated clearance if the route or destination of a flight plan filed with ATC has been changed by him or the company or the operations officer before departure.

(3) That it is the responsibility of the company or operations office to inform the pilot when they make a change to the filed flight plan.

(4) That it is the responsibility of the pilot to inform ATC in his initial call-up (for clearance) when the filed flight plan has been (a) amended or (b) canceled and replaced with a new filed flight plan.

Note—The facility issuing a clearance may not have received the revised route or the revised flight plan by the time a pilot requests clearance.

4.5.2 The controller will issue a detailed clearance when he knows that the original filed flight plan has been changed or when the pilot requests a full route clearance.

4.5.3 The clearance as issued will include the destination airport filed in the flight plan.

4.5.4 ATC procedures now require the controller to state the Standard Instrument Departure (SID) name, the current number and the SID Transition name after the phrase "Cleared to (destination) airport," and prior to the phrase, "then as filed," for ALL departure clearances when the SID or SID Transition is to be flown. The procedure applies whether or not the SID is filed in the flight plan.

4.5.5 Standard Terminal Arrivals (STAR's), when filed in a flight plan, are considered a part of the filed route of flight and will not normally be stated in an initial departure clearance. If the ARTCC's jurisdictional airspace includes both the departure airport and the fix where a STAR or STAR Transition begins, the STAR name, the current number, and the STAR Transition name MAY be stated in the initial clearance.

4.5.6 "Cleared to (destination) airport as filed" does NOT include the en route altitude filed in a flight plan. An en route altitude will be stated in the clearance or the pilot will be advised to expect an assigned/filed altitude within a given time frame or at a certain point after departure. This may be done verbally in the departure instructions or stated in the SID.

4.5.7 In a radar and a nonradar environment, the controller will state "Cleared to (destination) airport as filed" or:

(1) If a SID or SID Transition is to be flown, specify the SID name, the current SID number, the SID Transition name, the assigned altitude/flight level, and any additional instructions (departure control frequency, beacon code assignment, etc.) necessary to clear a departing aircraft via the SID/SID Transition and the route filed.

Example:

NATIONAL SEVEN TWENTY CLEARED TO MIAMI AIRPORT, INTERCONTINENTAL ONE DEPARTURE, LAKE CHARLES TRANSITION, THEN AS FILED MAINTAIN FLIGHT LEVEL TWO SEVEN ZERO.

(2) When there is no SID or when the pilot cannot accept a SID, specify the assigned altitude/flight level, and any additional instructions necessary to clear a departing aircraft via an appropriate departure routing and the route filed.

Note—A detailed departure route description or a radar vector may be used to achieve the desired departure routing.

(3) If necessary to make a minor revision to the filed route, specify the assigned SID/SID Transition (or departure routing), the revision to the filed route, the assigned altitude/flight level and any additional instructions necessary to clear a departing aircraft.

Example:

JET STAR ONE FOUR TWO FOUR CLEARED TO ATLANTA AIRPORT, SOUTH BOSTON TWO DEPARTURE, THEN AS FILED, EXCEPT CHANGE ROUTE TO READ, SOUTH BOSTON VICTOR 20 GREENSBORO, MAINTAIN ONE SEVEN THOUSAND.

(4) Additionally, in a nonradar environment, specify one or more fixes as necessary to identify the initial route of flight.

Example:

CESSNA THREE ONE SIX FOXTROT CLEARED TO CHARLOTTE AIRPORT AS FILED VIA BROOKE, MAINTAIN SEVEN THOUSAND.

4.5.8 To ensure success of the program, pilots should:

(1) Avoid making changes to a filed flight plan just prior to departure.

(2) State the following information in the initial call-up to the facility when no change has been made to the filed flight plan: Aircraft call sign, location, type operation (IFR) and the name of the airport (or fix) to which you expect clearance.

Example:

"WASHINGTON CLEARANCE DELIVERY (or Ground Control if appropriate) AMERICAN SEVENTY SIX AT GATE ONE, I-F-R LOS ANGELES."

If the flight plan has been changed, state the change and request a full route clearance.

Example:

"WASHINGTON CLEARANCE DELIVERY, AMERICAN SEVENTY SIX AT GATE ONE I-F-R SAN FRANCISCO. MY FLIGHT PLAN ROUTE HAS BEEN AMENDED (or destination changed), REQUEST FULL ROUTE CLEARANCE."

(3) Request verification or clarification from ATC if ANY portion of the clearance is not clearly understood.

(4) When requesting clearance for the IFR portion of a VFR-IFR flight, request such clearance prior to the fix where IFR operation is proposed to commence in sufficient time to avoid delay. Use the following phraseology:

Example:

"LOS ANGELES CENTER, APACHE SIX ONE PAPA, V-F-R, ESTIMATING PASO ROBLES V-O-R AT THREE TWO, ONE THOUSAND FIVE HUNDRED, REQUEST I-F-R TO BAKERSFIELD."

4.6 Instrument Departures

4.6.1 Standard Instrument Departures (SID's)

4.6.1.1 A Standard Instrument Departure (SID) is an air traffic control coded departure procedure which has been established at certain airports to simplify clearance delivery procedures.

4.6.1.2 Pilots of civil aircraft operating from locations where SID procedures are effective may expect ATC clearances containing a SID. Use of a SID requires pilot possession of at least the textual description of the approved effective SID. Controllers may omit the departure control frequency if a SID clearance is issued and the departure control frequency is published on the SID. If the pilot dose not possess a charted SID or preprinted SID description or for any other reason does not wish to use a SID, he is expected to advise ATC. Notification may be accomplished by filing "NO SID" in the remarks section of the filed flight plan or by the less desirable method of verbally advising ATC.

4.6.1.3 All effective SID's are published in textual and graphic form by the National Ocean Survey in the *Terminal Procedures Publication (TPP).*

4.6.1.4 SID procedures will be depicted in one of two basic forms.

(1) Pilot Navigation (Pilot NAV) SID's are established where the pilot is primarily responsible for navigation on the SID route. They are established for airports when terrain and safety related factors indicate the necessity for a pilot NAV SID. Some pilot NAV SID's may contain vector instructions which pilots are expected to comply with until instructions are received to resume normal navigation on the filed/assigned route or SID procedure.

(2) Vector SID's are established where ATC will provide radar navigational guidance to a filed/assigned route or to a fix depicted on the SID.

4.6.2 Obstruction Clearance During Departure

4.6.2.1 Published instrument departure procedures and SID's assist pilots conducting IFR flight in avoiding obstacles during climbout to minimum en route altitude (MEA). These procedures are established only at locations where instrument approach procedures are published. Standard instrument takeoff minimums and departure procedures are prescribed in FAR 91.175. Airports with takeoff minimums other than standard (one statute mile for aircraft having two engines or less and one-half statute mile for aircraft having more than two engines) are described in airport listings on separate pages titled IFR TAKEOFF MINIMUMS AND DEPARTURE PROCEDURES, at the front of each U.S. Government published IAP and SID book. The approach chart and SID chart for each airport where takeoff minimums are not standard and/or departure procedures are published is annotated with a special symbol ▽ . The use of this symbol indicates that the separate listing should be consulted. These minimums also apply to SID's unless the SID's specify different minimums.

4.6.2.2 Obstacle clearance is based on the aircraft climbing at least 200 feet per nautical mile, crossing the end of the runway at least 35 feet AGL, and climbing to 400 feet above airport elevation before turning, unless otherwise specified in the procedure. A slope of 152 feet per nautical mile, starting no higher than 35 feet above the departure end of the runway, is assessed for obstacles. A minimum obstacle clearance of 48 feet per nautical mile is provided in the assumed climb gradient.

(1) If no obstacles penetrate the 152 feet per nautical mile slope, IFR departure procedures are not published.

(2) If obstacles do penetrate the slope, avoidance procedures are specified. These procedures may be: a ceiling and visibility to allow the obstacles to be seen and avoided; a climb gradient greater than 200 feet per nautical mile; detailed flight maneuvers; or a combination of the above. In extreme cases, IFR takeoff may not be authorized for some runways.

Example:

Rwy 17, 300-1 or standard with minimum climb of 220 feet per NM to 1,100.

4.6.2.3 Climb gradients are specified when required for obstacle clearance. Crossing restrictions in the SID's may be established for traffic separation or obstacle clearance. When no gradient is specified, the pilot is expected to climb at least 200 feet per nautical mile to MEA unless required to level off by a crossing restriction.

Example:

"CROSS ALPHA INTERSECTION AT OR BELOW FOUR THOUSAND; MAINTAIN SIX THOUSAND." The pilot climbs at least 200 feet per nautical mile to 6,000. If 4,000 is reached before ALPHA, the pilot levels off at 4,000 until passing ALPHA; then immediately resumes at least 200 feet per nautical mile climb.

4.6.2.4 Climb gradients may be specified to an altitude/fix, above which the normal gradient applies.

Example:

"MINIMUM CLIMB 340 FEET PER NM TO 2,700." The pilot climbs at least 340 feet per nautical mile to 2,700, then at least 200 feet per NM to MEA.

4.6.2.5 Some IFR departure procedures require a climb in visual conditions to cross the airport (or an on-airport NAVAID) in a specified direction, at or above a specified altitude.

Example:

"CLIMB IN VISUAL CONDITIONS SO AS TO CROSS THE McELORY AIRPORT SOUTHBOUND AT OR ABOVE SIX THOUSAND, THEN CLIMB VIA KEEMMLING R-033 TO KEEMMLING VOR-TAC."

(1) When climbing in visual conditions it is the pilot's responsibility to see and avoid obstacles. Specified ceiling and visibility minimums will allow visual avoidance of obstacles until the pilot enters the standard obstacle protection area. Obstacle avoidance is not guaranteed if the pilot maneuvers farther from the airport than the visibility minimum.

(2) That segment of the procedure which requires the pilot to see and avoid obstacles ends when the aircraft crosses the specified point at the required altitude. Thereafter, standard obstacle protection is provided.

4.6.2.6 Each pilot, prior to departing an airport on an IFR flight, should consider the type of terrain and other obstacles on or in the vicinity of the departure airport and:

(1) Determine whether a departure procedure and/or SID is available for obstacle avoidance.

(2) Determine if obstacle avoidance can be maintained visually or that the departure procedure or SID should be followed.

(3) Determine what action will be necessary and take such action that will assure a safe departure.

Note—The term *Radar Contact,* when used by the controller during departure, should not be interpreted as relieving pilots of their responsibility to maintain appropriate terrain and obstruction clearance.

Terrain/obstruction clearance is not provided by ATC until the controller begins to provide navigational guidance; i.e., radar vectors.

Example:

FREDERICK UNICOM CESSNA EIGHT ZERO ONE TANGO FOXTROT 10 MILES SOUTHEAST DESCENDING THROUGH (ALTITUDE) LANDING FREDERICK, REQUEST WIND AND RUNWAY INFORMATION FREDERICK.

FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT ENTERING DOWNWIND/BASE/FINAL (AS APPROPRIATE) FOR RUNWAY ONE NINER FULL STOP/TOUCH-AND-GO FREDERICK.

FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT CLEAR OF RUNWAY ONE NINER FREDERICK.

2.7.2.2 Outbound

Example:

FREDERICK UNICOM CESSNA EIGHT ZERO ONE TANGO FOXTROT (LOCATION ON AIRPORT) TAXIING TO RUNWAY ONE NINE, REQUEST WIND AND TRAFFIC INFORMATION FREDERICK.

FREDERICK TRAFFIC CESSNA EIGHT ZERO ONE TANGO FOXTROT DEPARTING RUNWAY ONE NINE. "REMAINING IN THE PATTERN" OR "DEPARTING THE PATTERN TO THE (DIRECTION) (AS APPROPRIATE)" FREDERICK.

Summary of Recommended Communication Procedures

Facility At Airport	Frequency Use	Broadcast Position	
		Outbound	Inbound
1. UNICOM (No Tower or FSS).	Communicate with UNICOM station on published CTAF frequency (122.7, 122.8, 122.725, 122.975, or 123.0). If unable to contact UNICOM station, use self-announce procedures on CTAF..	Before taxiing and before taxiing on the runway for departure..	10 miles out. Entering downwind, base, and final. Leaving the runway.
2. No Tower, FSS, or UNICOM.	Self-announce on MULTICOM frequency 122.9..	Before taxiing and before taxiing on the runway for departure..	10 miles out. Entering downwind, base, and final. Leaving the runway.
3. No Tower in operation, FSS open.	Communicate with FSS on CTAF..	Before taxiing and before taxiing on the runway for departure..	10 miles out. Entering downwind, base, and final. Leaving the runway.
4. FSS closed (No Tower).	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure..	10 miles out. Entering downwind, base, and final. Leaving the runway.
5. Tower or FSS not in operation.	Self-announce on CTAF.	Before taxiing and before taxiing on the runway for departure..	10 miles out. Entering downwind, base, and final. Leaving the runway.

3. IFR APPROACHES/GROUND VEHICLE OPERATIONS

3.1 IFR Approaches

When operating in accordance with an IFR clearance and ATC approves a change to the advisory frequency, make an expeditious change to the CTAF and employ the recommended traffic advisory procedures.

3.2 Ground Vehicle Operation

Airport ground vehicles equipped with radios should monitor the CTAF frequency when operating on the airport movement area and remain clear of runways/taxiways being used by aircraft. Radio transmissions from ground vehicles should be confined to safety-related matters.

3.3 Radio Control of Airport Lighting Systems

Whenever possible, the CTAF will be used to control airport lighting systems at airports without operating control towers. This eliminates the need for pilots to change frequencies to turn the lights on and allows a continuous listening watch on a single frequency. The CTAF is published on the instrument approach chart and in other appropriate aeronautical information publications. For further details concerning radio controlled lights, see AC 150/5340.27.

4. DESIGNATED UNICOM/MULTICOM FREQUENCIES

4.1 Communicatons Between Aircraft

CAUTION The Federal Communications Commissions (FCC) requires an aircraft station license to operate on UNICOM/MULTICOM frequencies and usage must be in accordance with Part 87 of the FCC Rules (see Section 87.29 regarding license applications). Misuse of these frequencies may result in either the imposition of fines and/or revocation/suspension of FCC aircraft station license.

4.2 Frequency Use

4.2.1 The following listing depicts UNICOM and MULTICOM frequency uses as designated by the Federal Communications Commission (FCC).

USE	FREQUENCY
Airports without an operating control tower..	122.700, 122.725, 122.800, 122.975, 123.000, 123.050, 123.075
(MULTICOM frequency) Activities of a temporary, seasonal, emergency nature or search and rescue, as well as, airports with no tower, FSS, or Unicom..	122.900
(MULTICOM frequency) Forestry management and fire suppression, fish and game management and protection, and environmental monitoring and protection..	122.925
Airports with control tower or FSS on airport.	122.950

NOTE — In some areas of the country, frequency interference may be encountered from nearby airports using the same UNICOM frequency. Where there is a problem, UNICOM operators are encouraged to develop a *least interference* frequency assignment plan for airports concerned using the frequencies designated for airports without operating control towers. UNICOM licensees are encouraged to apply for UNICOM 25 kHz spaced channel frequencies. Due to the extremely limited number of frequencies with 50 kHz channel spacing, 25 kHz channel spacing should be implemented. UNICOM licensees may then request FCC to assign frequencies in accordance with the plan, which FCC will review and consider for approval.

NOTE — Wind direction and runway information may not be available on UNICOM frequency 122.950.

4.2.2 The following listing depicts other frequency uses as designated by the Federal Communications Commission (FCC).

USE	FREQUENCY
Air-to-air communications & private airports (not open to the public).	122.750, 122.850
Air-to-air communications (general aviation helicopters).	123.025
Aviation instruction, Glider, Hot Air Balloon **(not to be used for advisory service)**.	123.300, 123.500

5. USE OF UNICOM FOR ATC PURPOSES

5.1 UNICOM service may be used for air traffic control purposes, only under the following circumstances:

5.1.1 Revision to proposed departure time.

5.1.2 Takeoff, arrival, or flight plan cancellation time.

5.1.3 ATC clearance, provided arrangements are made between the ATC facility and the UNICOM licensee to handle such messages.

6. AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)

6.1 ATIS is the continuous broadcast of recorded, noncontrol information in selected high activity terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information. Pilots are urged to cooperate in the ATIS program as it relieves frequency congestion on approach control, ground control, and local control frequencies. The Airport/Facility Directory indicates airports for which ATIS is provided.

6.2 ATIS information includes the time of the latest weather sequence, ceiling, visibility, obstructions to visibility, temperature, dew point (if available), wind direction (magnetic), and velocity, altimeter, other pertinent remarks, instrument approach and runway in use. The ceiling/sky condition, visibility, and obstructions to vision may be omitted from the ATIS broadcast if the ceiling is above 5,000 feet and the visibility is more than 5 miles. ATIS is continuously broadcast on the voice feature of a TVOR/VOR/VORTAC located on or near the airport, or on a discreet VHF/UHF frequency. The departure runway will only be given if different from the landing runway except at locations having a separate ATIS for departure. The broadcast may include the appropriate frequency and instructions for VFR arrivals to make initial contact with approach control. Pilots of aircraft arriving or departing the terminal area can receive the continuous ATIS broadcast at times when cockpit duties are least pressing and listen to as many repeats as desired. ATIS broadcast shall be updated upon the receipt of any official hourly and special weather. A new recording will also be made when there is a change in other pertinent data such as runway change, instrument approach in use, etc.

Sample Broadcast:

DULLES INTERNATIONAL INFORMATION SIERRA. 1300ZULU WEATHER. MEASURED CEILING THREE THOUSAND OVERCAST. VISIBILITY THREE, SMOKE. TEMPERATURE SIX EIGHT. WIND THREE FIVE ZERO AT EIGHT. ALTIMETER TWO NINER NINER TWO. ILS RUNWAY ONE RIGHT APPROACH IN USE. LANDING RUNWAY ONE RIGHT AND LEFT. DEPARTURE RUNWAY THREE ZERO. ARMEL VORTAC OUT OF SERVICE. ADVISE YOU HAVE SIERRA.

6.3 Pilots should listen to ATIS broadcasts whenever ATIS is in operation.

6.4 Pilots should notify controllers on initial contact that they have received the ATIS broadcast by repeating the alphabetical code word appended to the broadcast.

Examples:

"INFORMATION SIERRA RECEIVED."

6.5 When the pilot acknowledges that he has received the ATIS broadcast, controllers may omit those items contained on the broadcast if they are current. Rapidly changing conditions will be issued by Air Traffic Control and the ATIS will contain words as follows:

"LATEST CEILING/VISIBILITY/ALTIMETER/WIND/(OTHER CONDITIONS) WILL BE ISSUED BY APPROACH CONTROL/TOWER."

The absence of a sky condition/ceiling and/or visibility on ATIS indicates a sky condition/ceiling of 5,000 feet or above and visibility of 5 miles or more. A remark may be made on the broadcast, "The weather is better than 5,000 and 5," or the existing weather may be broadcast.

6.6 Controllers will issue pertinent information to pilots who do not acknowledge receipt of a broadcast or who acknowledge receipt of a broadcasts which is not current.

6.7 To serve frequency-limited aircraft, Flight Service Stations (FSS) are equipped to transmit on the omnirange frequency at most en route VORs used as ATIS voice outlets. Such communication interrupts the ATIS broadcast. Pilots of aircraft equipped to receive on other FSS frequencies are encouraged to do so in order that these override transmissions may be kept to an absolute minimum.

6.8 While it is a good operating practice for pilots to make use of the ATIS broadcast where it is available, some pilots use the phrase "Have Numbers" in communications with the control tower. Use of this phrase means that the pilot has received wind, runway and altimeter information ONLY and the tower does not have to repeat this information. It does not indicate receipt of the ATIS broadcast and should never be used for this purpose.

7. AIRPORT RESERVATIONS OPERATIONS AND PROCEDURES

7.1 The Federal Aviation Administration (FAA) operates the Computerized Voice Reservation System (CVRS) which is used to make arrival and/or departure reservations at airports designated by Federal Aviation Regulation (FAR) Part 93 Subpart K as High Density Traffic Airports (HDTA). The system may also be used to make arrival and/or departure reservations at airports which are part of a Special Traffic Management Program (STMP). Some STMP's may require users to contact the controlling Air Route Traffic Control Center (ARTCC) to make reservations, while others will use the CVRS to make reservations. Pilots should check current Notices to Airmen (NOTAM) to determine airports included in a special traffic management program and reservations procedures.

7.2 HIGH DENSITY TRAFFIC AIRPORTS (HDTA):

7.2.1 The FAA, by FAR Part 93, Subpart K, as amended, has designated the John F. Kennedy (JFK), LaGuardia (LGA), Chicago O'Hare (ORD), Washington National (DCA), and Newark (EWR) Airports as high density airports and has prescribed air traffic rules and requirements for operating aircraft to and from these airports. (The quota for EWR has been suspended indefinitely.) Reservations for JFK are required between 3:00 p.m. and 7:59 p.m. local time. Reservations at ORD are required between 6:45 a.m. and 9:15 p.m. local time. Reservations for LGA and DCA are required between 6:00 a.m. and 11:59 p.m. local time. Helicopter operations are excluded from the requirement for a reservation.

NOTE — Time periods for ORD are in 30-minute increments.

7.2.2 The FAA has established an Airport Reservations Office (ARO) to receive and process all Instrument Flight Rules (IFR) requests for operations at the designated HDTA's. This office monitors operation of the high density rule and allots reservations on a "first-come-first-served" basis determined by the time the request is received at the reservation office. Standby lists are not maintained. The ARO utilizes the CVRS to make all reservations. Users may access the computer system using a touch tone telephone, rotary dial telephone, or a personal computer equipped with a modem. Requests for IFR reservations will be accepted starting 48 hours prior to the proposed time of operation at the affected airport. For example, a request for an 11:00 a.m. reservation on a Thursday will be accepted beginning at 11:00 a.m. on the preceding Tuesday. An exception to the 48 hour limitation is made for weekends to recognize normal business hours. Consequently, a reservation request for an IFR operation on Monday would be accepted on the previous Thursday, starting at the proposed hour of operation. Similarly, requests for IFR operations on Tuesday would be accepted on the previous Friday, starting at the proposed hour of operation. For example, a request for an 11:00 a.m. reservation on Tuesday would be accepted beginning at 11:00 a.m. on Friday. Another exception to the 48 hour time limit is made for users who make both an arrival and departure reservation provided they both fall on the same calendar day and they are both made during the same phone call. For example, a reservation request for an 11:00 a.m. arrival on Friday and a 4:00 p.m. departure on Friday may be made beginning at 11:00 a.m. Wednesday.

7.2.3 A maximum of two transactions per phone call will be accepted.

7.2.4 The ARO will not provide scheduling according to planned departure/arrival time. Assignments will be made on an hourly or 30-minute basis, e.g., an approved reservation for 1300 covers an operation any time between 1300 and 1359 and an approved reservation for 0845 at O'Hare covers an operation between 0845 and 0914.

7.2.5 An approved reservation does not constitute a warranty against traffic delays nor does it guarantee arrival and/or departure within such allocated hours. Also, a reservation does not constitute an Air Traffic Control (ATC) clearance.

7.2.6 The filing of a request for an IFR reservation does not constitute the filing of an IFR flight plan as required by regulation. The IFR flight plan should be filed only after the reservation is obtained and should be filed through normal channels. The ARO is not equipped to accept or process IFR flight plans.

7.3 IFR RESERVATIONS:

7.3.1 If operating IFR, an IFR reservation is required prior to takeoff for any operation to or from a high density airport. Users may obtain IFR reservations in either of two ways. They may file their request with the nearest Flight Service Station (FSS) by any available means or call the ARO's interactive computer system via touch-tone telephone, rotary dial telephone, or personal computer modem. The telephone numbers for the ARO computer are: Using touch-tone or rotary phone: 1-800-875-9694. For Personal Computer and Modem: 1-800-875-9759.

7.3.1.1 Users may contact the ARO at 202-267-5312 if they have a problem making a reservation or have a question concerning the HDTA regulations. (Being unable to make a reservation due to the fact that all the slots have been allocated is not considered as having a problem making a reservation).

7.3.2 When filing a request for an IFR reservation, the pilot should be prepared to provide the following information:

7.3.2.1 Name(s) of high density traffic airport(s) for which the pilot wishes reservation(s).

7.3.2.2 Date(s) and hour(s) (UTC) of proposed operation(s).

7.3.2.3 Aircraft identification/tail number(s).

7.3.3 Should the requested time not be available, the user will be offered the closest time before or after the requested time. If an alternate time is accepted, this will be considered as an assigned allocation unless subsequently cancelled by the user.

7.3.4 Users are encouraged to advise the ARO whenever they need to change their reservation or to cancel their IFR reservation when it is known that the reservation will not be used. For other than scheduled air carriers/commuters, a cancellation should be made directly to the ARO computer system or an FSS.

7.3.5 The following information should be available when cancelling a reservation:

7.3.5.1 Aircraft identification/tail number.

7.3.5.2 Airport for which reservation was made.

7.3.5.3 Date and Time (UTC) of reservation.

7.3.5.4 Reservation number.

7.3.6 To ensure retention of a reservation, a pilot holding an IFR arrival reservation must retain his IFR status until in contact with the terminal ATC facility.

7.3.7 Reservations are required when filing one of the HDTA's as an alternate airport. Pilots are encouraged to file airports other than the high density as alternate airports.

7.4 ADDITIONAL IFR RESERVATIONS:

7.4.1 If favorable conditions in the system and at the HDTA indicate a significant delay is not likely in the short term, the ARO may coordinate with the HDTA tower to determine that additional IFR reservations may be accommodated for a specific time period. This is an additional IFR reservation as described in FAR Part 93. If additional IFR reservations can be accommodated, they are administered by the ARO under the procedures described above.

7.4.2 An operator of an IFR unscheduled operation may take off or land an aircraft without regard to the maximum allocation if a reservation is obtained from ATC in accordance with the procedures above. A reservation is granted for an additional IFR operation only if it can be accommodated by ATC without significant additional delay to operations already allocated. The granting of an additional IFR reservation is contingent upon dynamic, short-term traffic and weather conditions. Generally, availability of additionals will not be known more than 8 hours in advance of the current time. If available, IFR additionals will be granted on a first-come-first-served basis.

7.4.3 An operator who has been unable to obtain a reservation under the normal 48 hour in advance procedure may find they are able to obtain a reservation on the scheduled day of operation when additionals can be authorized.

7.5 VISUAL FLIGHT RULES (VFR) RESERVATIONS:

7.5.1 The operator of a VFR unscheduled operation may take off or land an aircraft under VFR at an HDTA if a departure or arrival reservation is obtained from the FAA ATC facility serving the HDTA.

7.5.2 Under FAR, Part 93, a VFR operation is considered to be an additional operation. VFR additional operations may be granted by ATC if they can be accommodated without significant delay to operations already allocated. In addition, the reported ceiling at the HDTA must be at least 1,000 feet and the reported ground visibility at least 3 miles.

7.5.3 Each HDTA lies within Class B airspace. A clearance from ATC to enter the airspace or depart the airport under VFR constitutes an approval for a VFR additional reservation.

7.5.4 Any time an HDTA is not authorizing VFR operations, a NOTAM to that effect will be issued by the controlling ATC facility and a recording placed on the Automated Terminal Information Service. This information can be obtained from any FSS or by referring to the HDTA teletype weather report. The code "VNA" at the end of the weather report indicates VFR arrival reservations are not authorized. The indication will not be made when IFR weather conditions exist.

7.5.5 The requirements for obtaining reservations pursuant to FAR Part 93, Subpart K, are mandatory. Failure to operate in accordance with the FAR may be grounds for enforcement action.

7.6 SPECIAL TRAFFIC MANAGEMENT PROGRAMS (STMP):

7.6.1 Special procedures may be established when a location requires special traffic handling to accommodate above normal traffic demand (e.g., the Indianapolis 500, Super Bowl, etc.) or reduced airport capacity (e.g., airport runway/taxiway closures for airport construction). The special procedures may remain in effect until the problem has been resolved or until local traffic management procedures can handle the situation and a need for special handling no longer exists.

7.6.2 CVRS may be used to allocate the reservations during an STMP. If CVRS is being used, the toll-free telephone numbers will be advertised by NOTAM. Be sure to check current NOTAM's to determine what airports are included in an STMP, days and times reservations are required, time limits for reservations requests, and who to contact for reservations.

7.7 MAKING HDTA/STMP RESERVATIONS USING THE CVRS:

7.7.1 Computer Modem Users: A Personal Computer (PC) may be used to make reservations on the CVRS. Equipment required is a computer with a modem capable of a 300 to 9600 baud rate and a communications software program. There are several communicatioons software programs available from many computer stores. The type program required is one which is used to connect with a Bulletin Board System (BBS). The CVRS modem data is transmitted using No Parity, 8 data bits, and 1 stop bit (N,8,1). Be sure your computer software is set to these parameters.

7.7.2 When your computer connects with CVRS, you will be presented with a screen that will ask you to log on. If this is the first time you have logged onto the CVRS, you will be asked for your name, the city you are calling from, and a password. (Be sure to record your password for future use). CVRS uses your name and password to save your computer "set-up" so that the next time you call you will have the same display. After you have logged on, every thing you need to do involving a reservation is menu driven. There are also several files you can download which explain CVRS operations in greater detail.

7.7.3 Telephone users: When using the telephone to make a reservation, you are prompted for input of information about what you wish to do. All input is accomplished using the keypad or rotary dial on the telephone. The only problem with a telephone is that most keys have a letter and number associated with them. When the system asks for a date or time, it is expecting an input of numbers. A problem arises when entering a tail number. The system does not detect if you are entering a letter (alpha character) or a number. Therefore, when entering a tail number two keys are used to represent each letter or number. When entering a number, precede the number you wish by the number 0 (zero) i.e. 01, 02, 03, 04, ... If you wish to enter a letter, first press the key on which the letter appears and then press 1, 2, or 3, depending upon whether the letter you desire is the first, second, or third letter on that key. For example to enter the letter "N" first press the "6" key because "N" is on that key, then press the "2" key because the letter "N" is the second letter on the "6" key. Since there are no keys for the letters "Q" and "Z" CVRS pretends they are on the number "1" key. Therefore, to enter the letter "Q", press 11, and to enter the letter "Z" press 12.

NOTE — Users are reminded to enter the "N" character with their tail numbers. (See Table 7.7.3[1]).

7.7.3[1] CODES FOR TAIL NUMBER INPUT ONLY

A-21	J-51	S-73	1-01
B-22	K-52	T-81	2-02
C-23	L-53	U-82	3-03
D-31	M-61	V-83	4-04
E-32	N-62	W-91	5-05
F-33	O-63	X-92	6-06
G-11	P-71	Y-93	7-07
H-42	Q-11	Z-12	8-08
I-43	R-72	0-00	9-09

7.7.4 Additional helpful key entries: (See Table 7.7.3[2]).

7.7.3[2]

#	After entering a tail number, depressing the "pound key" (#) twice will indicate the end of the tail number.
*2	Will take the user back to the start of the process.
*3	Will repeat the tail number used in a previous reservation.
*5	Will repeat the previous question.
*8	Tutorial Mode: In the tutorial mode each prompt for input includes a more detailed description of what is expected as input. *8 is a toggle on/off switch. If you are in tutorial mode and enter *8, you will return to the normal mode.
*0	Expert mode: In the expert mode each prompt for input is brief with little or no explanation. Expert mode is also an on/off toggle.

8. HEAVY TRAFFIC AROUND MILITARY FIELDS

8.1 Pilots are advised to exercise vigilance when in close proximity to most military airports. These airports may have jet aircraft traffic patterns extending up to 2,500 feet above the surface. In addition, they may have an unusually heavy concentration of jet aircraft operating within a 25 nautical mile radius and from the surface to all altitudes. The precautionary note also applies to the larger civil airports.